ELECTRICAL REVIEW

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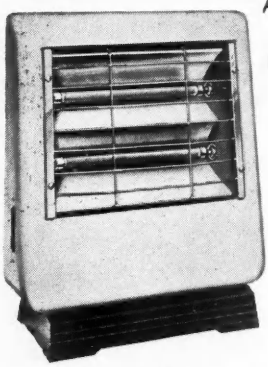

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ELECTRICAL REVIEW

Vol. CXLIX No. 3842 13TH JULY, 1951

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Valve-Making

BRITISH TEAM REPORTS ON AMERICAN METHODS

THE valve-making section of the British engineering industry is composed of some sixty concerns. One of the smallest employs 40 men and the largest 2,500; together they provide work for 14,000 men and women who last year produced steel, iron and non-ferrous industrial valves (excluding plumbers' brass fittings) valued at £18 million. Half the combined output came from firms employing (in valve manufacture) 600 and more people.

These figures represent a considerable productive effort, considering that the 1946 deliveries were worth just over £5 million; nevertheless the B.E.A. has not been able to acquire all the valves it needs and has had to import some 4,000 of the larger types from Italy.

Scope for Increased Productivity

Notwithstanding the achievement of the industry in nearly trebling the volume of its products in the last five years all valve manufacturers in Britain "can do much to increase the productivity of their factories." That is the conclusion come to by the Valve Productivity Team which, after inspecting thirteen factories in the U.K., visited those of seventeen companies in the U.S. during a six weeks' tour.

The report it has published this week* describes the British industry as progressive—some firms have practically rebuilt themselves—but the average productivity of U.K. factories is smaller than that in the United States, although theirs is not double ours. Moreover they "handle" materials better than we do, so that home factories might save some costs in that direction.

Use of Welding

The team did not see anything during its United States tour which is not known; but it did find better and much wider application of known principles and methods, including the general use of welding. More valves are made in several pieces and finished by welding them together whereas, though often inconvenient, they continue to be made in one piece at home. The team accordingly considers education of technical staffs for better engineering planning within the factory to be of prime importance.

Factories in the U.S. do succeed in getting bigger batches of output, which is to be expected in view of the larger

* "Valves," price 3s 6d post free, from the British Valve Manufacturers' Association, 32, Victoria Street, London, S.W.1, or the Anglo-American Council on Productivity, 21, Tothill Street, London, S.W.1.

market they serve; incidentally half the total output is understood to come from four companies. Manufacturers in the U.K. are therefore urged to make more of fewer types of valves, although one wonders where the materials are to come from. Some U.K. factory buildings are old-fashioned; insufficiently heated workshops may be one of the factors which have a detrimental influence on high productivity in the winter months. This team, which was one of the first to devote much of its visit to the study of engineering machine shops, also recommends that attention be paid to their artificial lighting. Members of the team noticed that the intensity of light at the working level was much greater in many American machine shops. Apart from suggesting the introduction of more " automatics " and special-purpose machine-tools, the team found those commonly used in the U.S. valve-making industry to be quite similar to our own.

CHEAP POWER

The waters of the River Zambesi, a mile wide, plunging over the 415ft cataract of the Victoria Falls, have long been visualized as a source of hydro-electric power. Another, narrower, part of the great river's course may, however, be exploited first. From a report just issued, it appears that the Kariba Gorge could provide a 1,000 MW installation capable of producing power at the remarkably low figure of 0·0899d/kWh sent out, or 0·1703d/kWh delivered at the receiving stations. Substantial outlets for the power are to be found in the copper fields of Northern Rhodesia and the developing industries (gold mining, chrome, iron and asbestos) of Southern Rhodesia, where also extensive coal measures are believed to exist. Additional benefits would derive from the stabilization of the river.

NEW FUEL STUDY

In his presidential address at the Brighton Convention Sir Henry Self touched upon the question of co-ordinating the uses of coal, gas and electricity. He said that short-term remedies based on persuasion and education could have only a limited effect and there was a fundamental problem which called for serious study and for the formulation of " long-term national targets " looking ahead to the developments which were in sight. This has been followed by an announcement by the Minister of Fuel and Power that he is appointing a committee to report upon the proper uses and true costs of the various forms of fuel. In present circumstances, which are likely to persist, the desirability of such a step cannot be questioned. It must be realized, however, that there are no absolute standards by which " proper uses " can be determined and that success in allocating fields of use can be achieved only by compulsion.

SUPERVISION OF BOARDS

Lord Strabolgi raised in the House of Lords last week the question of the supervision of the working of national boards. He mentioned three methods which had been suggested to secure some measure of Parliamentary control. There is already a degree of Parliamentary control; in the case of every board a Minister is ultimately responsible for its operations, but it has been shown to be impossible for a Minister (let alone the House of Commons) to concern himself too closely with the detailed or " day-to-day " business of the boards. Other, less direct, methods have been proposed but whether they would be satisfactory is questionable. We are inclined to agree with Sir Henry Self that " there is no real substitute for the relentless pursuit of economy by the industry itself "—that is economy with efficiency—but some boards may need spurring on to this pursuit.

MINERS' PENSIONS

In view of the decision of the trade unions concerned to press the British Electricity Authority to institute a pension scheme for manual workers it is of interest to have details of a scheme drawn up by another publicly-owned concern—the National Coal Board. This is a contributory scheme in which miners pay 1s 6d weekly and surface workers 1s 3d; the Board contributes 2s and 1s 8d a week respectively. These weekly payments are " units " and contributions cease when the figure of 3,510 is reached or the worker attains the age of 65. Extra units are credited for good attendance and men over 47 are given credit for past service. The maximum normal amount of pension is 30s weekly and the minimum 10s. There are provisions for retirement on account of incapacitation and for widows and dependent children.

Fluorescent Floodlighting

Colour Displays at the Festival Gardens

By R. W. SHAW and W. J. VINE, F.I.E.S.*

THE extent to which fluorescent lamps have been used for outdoor lighting in the Festival Gardens in Battersea Park is one of the more notable achievements of the Festival illuminations in London. Fluorescent lamps have been used for interior lighting almost from their earliest days, but it was commonly accepted that their employment in floodlighting schemes would tend to produce " flat " effects.

Contrasting shadows are sometimes essential, particularly when floodlighting buildings and structures embodying architectural features in relief, since the eye depends largely upon these contrasts to establish the impression of form when the object is so far distant as to be beyond the limits of stereoscopic discernment. But the eye is also accustomed to interpret such vision in terms of daylight, the source of which is generally above the object being viewed. Daylight shadows are therefore normally observed on the undersides of copings, cornices, windowsills, etc., with the high lights above. Since the tendency in floodlighting is to reverse this, great care has to be taken when positioning light sources to obtain the most natural effect.

Though not possessing the

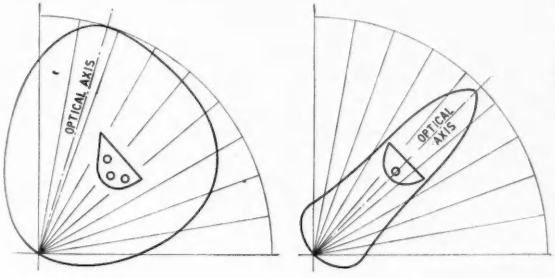


Fig. 1.—Polar curves of *(left)* **asymmetric wide angle floodlight with three 80 W lamps and** *(right)* **symmetric narrow angle floodlight with one 80 W lamp**

* Thorn Electrical Industries, Ltd.

all-round optical control of a system comprising filament lamp and reflector, a fluorescent lamp can be arranged in a housing to give reasonably accurate control in a direction at right angles to the axis of the lamp. Polar curves of two such arrangements (Fig. 1) show that results comparable with those of the best filament lamp floodlighting are possible in all but the most exacting conditions.

Another form of contrast depends for its effect upon the use of colour. In fact, when colour is introduced, fluorescent floodlighting really comes into its own. With filament lamps colour floodlighting necessitates the use of filters of glass, plastic, or gelatine. Apart from the limitations in colour range, the absorption of light by these filters is considerable as is shown in Table 1.

To obtain equivalent illumination between white and coloured filament systems, lamp ratings have to be stepped up considerably for the latter. With the three primary colours, for example, the loading would have to be five times as great for red or green and 50 times as great for blue. Fortunately, eye sensitivity is an important factor which changes with the colour involved and in floodlighting it is found that for equivalent visual effect lower levels of colour are acceptable: say twice the loading for red, four times for green and seven to eight times for blue.

With fluorescent lamps, however, the light can be generated in colour generally without the use of filters. Using three primary colours and a dimmer circuit, many colours can be synthesized in a moment by the adjustment of the dimmer controls. The range, both in chromaticity and intensity, is almost infinite, while the colour effect has a " punch " and life which must be seen to be believed. The efficiency of a white fluorescent lamp is 2½ to 3 times that of a filament lamp, but the disparity is far greater when natural coloured fluorescent lamps, those which do not use filters, are concerned.

Thus, to give the equivalent illumination and eye response levels to a 500 W filament lamp (8,000 lumens approximately) with filters and with coloured fluorescent lighting —basing the latter on the efficiencies of a 4ft 40 W natural coloured lamp—the loadings shown in Table 2 would be required.

In floodlighting it is the equivalent eye response which is the more important and here the relationship between fluorescent and filament-plus-filter loadings are 2½ to 1 for white, 7½ to 1 for red, 23½ to 1 for green and 89 to 1 for blue. In practice, however, one has to take into consideration variations of efficiency by the use of other size fluorescent lamps and losses in the control gear; but at the worst—in specialized applications employing 2ft 40 W lamps as in stage lighting—the ratio of efficiencies is of the order of 4 to 1 for red, 11 to 1 for green and 40 to 1 for blue.

It is worth noting that in a recent stage test with fluorescent dimmer control at the Royal Opera House, Covent Garden, comparative loadings on the fluorescent and incandescent systems when producing equivalent intensities of No. 18 blue on the cyclorama were 5 and 50 kW respectively.

TABLE 1.—ABSORPTION OF LIGHT BY FILTERS

Filter No.	Colour	Per cent absorption
4	Medium amber	24
6	Primary red	81
12	Deep rose	91
16	Blue green	79
19	Dark blue	96
20	Primary blue	98
21	Pea green	36
24	Dark green	79
25	Purple	96
26	Mauve	92½
32	Medium blue	95½
39	Primary green	78

TABLE 2.—COMPARATIVE LAMP LOADINGS

	White Watts	Primary Red Watts	Primary Green Watts	Primary Blue Watts
Equivalent illumination:				
Filament ..	500	2,600	2,400	25,000
Fluorescent ..	190	320	100	220
Equivalent eye response:				
Filament ..	500	1,000	2,000	4,000
Fluorescent ..	190	130	85	45

Control of Fluorescent Colours

The development of dimmer control of fluorescent lighting to a point at which it can be used successfully for floodlighting, either for stage or outdoor display work, has been energetically pursued by Thorn Electrical Industries, Ltd. It is only two years since the first demonstrations were staged at the Boltons Theatre, Kensington. In the intervening period more than one hundred stage productions have employed the system and five theatres have installed

it permanently. Further experimental work enabled the company to demonstrate open-air floodlighting in Battersea Park last October for the Festival authorities so successfully that it was commissioned to execute several schemes covering static colour floodlighting of trees, automatic colour changing floodlighting, fountain lighting and other underwater systems. Some of the schemes introduced problems in light control previously considered beyond the capabilities of fluorescent lamps.

Trees are among the most difficult subjects as the shape of the tree, its colouring and foliage constantly vary, not only from tree to tree but as the season changes. Fluorescent light imparts more character to trees by producing a fully three-dimensional effect throughout and emphasizing form while allowing for flexibility of colouring, even to the extent of providing the light green of spring, the full green of mid-summer and the autumnal tints within a few moments irrespective of the actual state of the leaves. The special dimmer equipment which is used in the Festival Gardens permits readjustment of the positions and colours as the foliage changes throughout the year.

The most extensive installation, covering several acres of trees in Battersea Park, is that surrounding the Peter Pan Railway in the children's section, the open air theatre and the West End Restaurant, all of which are floodlit in colour. Thirty-five major trees, including most of the traditional British species and all well over 50 years old, are illuminated together with adjacent shrubberies and flower beds. Sixteen of the trees are illuminated statically in green, the other nineteen changing colour having motor-operated controllers.

The fittings are anodized aluminium reflectors of approximately parabolic contour, each housing three 5ft 80 W lamps in pink, green and blue. By this means colour blending takes place at the light source as compared with colour mixing in a filament lamp system using separate floodlights. Apart from the technical advantages, this arrangement represents a considerable reduction of the cost of the equipment involved.

There are 136 of these fittings around the trees in carefully selected positions. The reflectors are open to the weather, and the lamp ends, together with the lampholders, are made weatherproof by special composition sleeves designed to keep rain and condensation clear of the electrical contacts. Wherever possible fittings are mounted on roofs, or among the shrubberies (Fig. 2); they are not normally seen from paths open to visitors.

A cycle of colour change (Fig. 3) for the Peter Pan Railway and that for the West

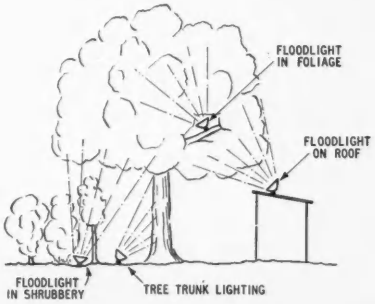


Fig. 2.—Example of tree floodlighting

End Restaurant was agreed with the Festival authorities. Such is the flexibility of the system, however, that different trees are bathed successively in various hues, while one is illuminated in two colours twice in each cycle. The average load of the whole area is just on 30 kW. To have obtained a similar effect with filament lighting would have required over 300 kW. The latter figure may seem high, but the actual light intensity on the foliage is of an order far in excess of anything of this nature yet seen in colour.

The control of this installation is centred in a motor-operated dimmer (Fig. 4) which uses the basic circuit originally developed for stage lighting. It is an extension of the Atlas Quickstart circuit and the fundamental principles are maintenance of the cathodes at emission temperatures through a special cathode heating transformer with independent control of the arc through a choke and variable resistance in series as has been described elsewhere.*

The manner in which the dimmer control board is connected to the numerous floodlights and their associated control gear is shown schematically in Fig. 5. The advantage of this arrangement is that it permits of extreme flexibility. The control of the various dimmer circuits is by a chain and sprocket drive, which is capable of adjustment, permitting rapid modification of colour sequences as required. The lamps in the fittings themselves can be altered either by transposing the coloured lamps in each fitting, or by introducing a " foreign " colour for local effect; also the position of each individual floodlight can be adjusted.

Another project called for the external fluorescent floodlighting of an unglazed facsimile of the Crystal Palace to give the effect of a glazed building. This structure, which is at the end of the main vista overlooking the fountain lake, comprises a cane front in white on a scaffolding framework. Here the problem was to pick out the white canes without spilling light into the interior so that the front stands out in relief against its background. How this was done is shown in Fig. 6; twenty-two 80 W white lamps mounted in special reflectors, each having a polar curve as shown in (Fig. 1, right) are mounted at the base of the structure on the fireworks platform. Spill of light beyond the front is controlled by baffles, leaving the interior clear for other purposes. The circuits can be operated on dimmer control if desired, or may be

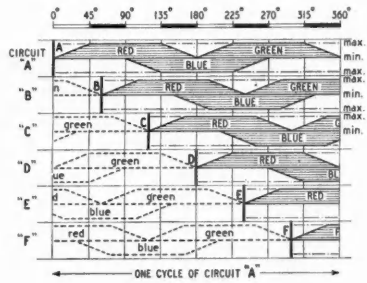
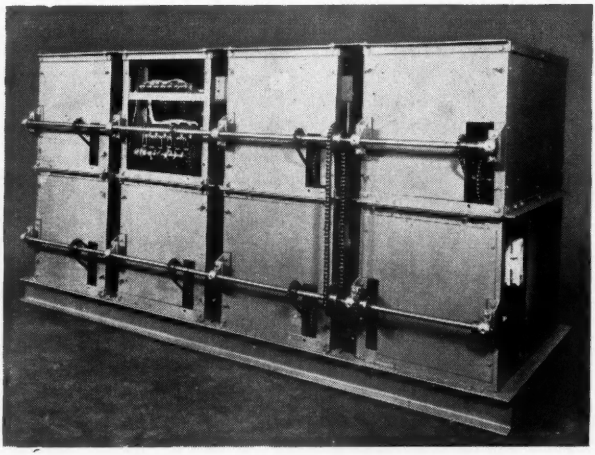


Fig. 3.—Colour changing cycle for floodlighting Peter Pan Railway

Fig. 4.—Motor-operated dimmer for colour changing fluorescent floodlighting



* " The Dimming of Fluorescent Lamps and its Application to the Theatre," J. W. Strange, Ph.D., A.R.C.Sc., *Transactions I.E.S.*, Vol. XV, 4, pars. 111–127 (1950).

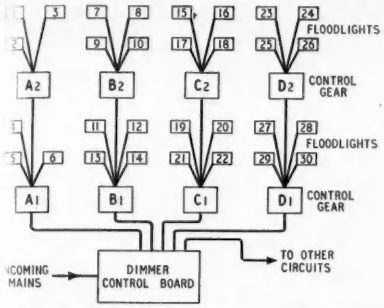
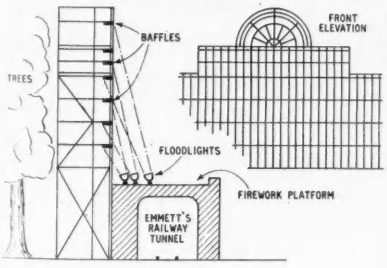


Fig. 5.—Schematic diagram of dimmer control board connection to numerous floodlights

left full-on. The vertical throw is to a maximum height of nearly 50ft.

The employment of fluorescent lighting for underwater illumination may appear to be fraught with difficulties. Initially it would seem essential to design and produce watertight fittings, but experiments showed that bare fluorescent lamps operate equally effectively under water. On this basis two installations were executed, one on the surround of the island in the boating pool (Fig. 7), where fluorescent lamps are mounted under the fender boards, the level being adjusted so that the lamps are just clear of the water except when waves created by boats break over them at the water line. The effect is of an unusual and charming colour interest at dusk when floral decorations are not so significant. In the pond which forms the centre of the forecourt of the Crescent Restaurant submerged fluorescent lamps again provide underwater lighting. These are mounted in a special reflector (Fig. 8) which is completely submerged, the control gear being

Fig. 6.—Method of simulating glazed surface of "Crystal Palace" facsimile



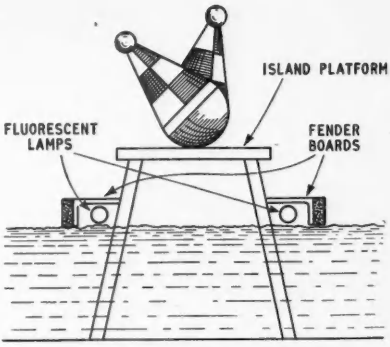
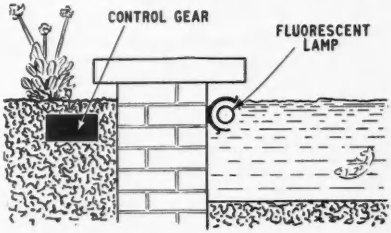


Fig. 7.—Underwater floodlighting in boating pool

Fig. 8.—Submerged floodlamps in forecourt pond



buried in the flower beds behind the coping.

In the main vista approaching the large lake are four pylon fountains. Each comprises a plastic pyramid of translucent material within which a jet of water plays upward (Fig. 9), falling back from the sides into a pool beneath. Four 30 W white fluorescent lamps provide the internal illumination of the pylons and these, like the fittings in the underwater lighting, are only protected at the terminal ends by composition sleeves. The control gear has been designed to work fully immersed and it is actually installed in the upper pool. The equipment is identical with that used to floodlight 100ft of box hedge and rose bushes flanking the main lawns where the control gear is buried in the earth adjacent to the lighting fittings.

One of the more unusual features of the Festival Gardens is the fountain tower. This vertical feature comprises a light steel frame set on a base of reinforced concrete arches. The upper part, consisting of golden coloured aluminium balls moving

down on endless chains, gives in sunlight and when illuminated at night an impression of cascading water. For night illumination,

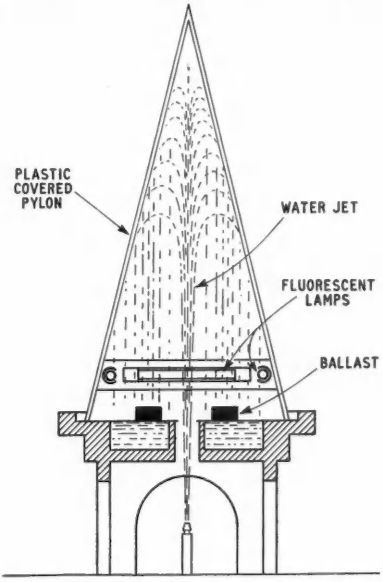
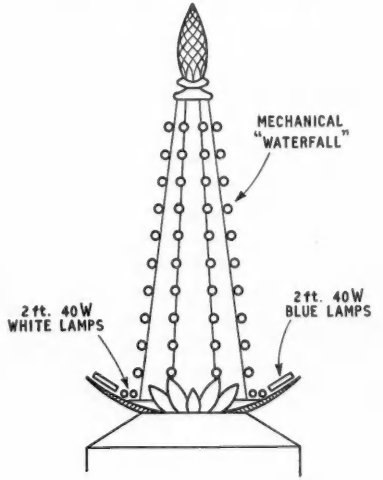


Fig. 9.—A pylon fountain of the main vista lake

Fig. 10.—Tower " fountain " of cascading spheres



eight 2ft 40 W white and eight 2ft 40 W blue fluorescent lamps are mounted in the petals of the decorative feature (Fig. 10) at the base of the fountain. These are bare lamps held in metal clips, the ends being protected by composition sleeves without any form of reflector. The lamps fully illuminate the top of the tower 40ft above.

At the South Bank exhibition site the north outside wall of the Character and Tradition Pavilion has also been floodlit by fluorescent lamps. The wall is sawtooth in section and the alternate faces are illuminated in green and blue by 2ft 40 W lamps mounted in anodized aluminium reflectors. The height of the building is just on 40ft, the wall being fully illuminated from top to bottom at a lighting level which has been assessed as equal to that of twelve 500 W filament floodlights. The actual fluorescent lighting load is just over 1 kW.

It is this consistent economy of fluorescent floodlighting as compared with the more usual filament lamp practice which is bound to become the most important factor in future outdoor lighting schemes, particularly in present-day circumstances when the capacity of generating stations is so heavily taxed. Taking the Festival as an example, the comparison between the present loadings on the fluorescent floodlighting installations and what would have been the load for equivalent effect with conventional practice is as follows:

	Fluorescent M.D.	Estimated equivalent filament-plus-filter M.D.
(1) *Tree Floodlighting*		
(a) static	13·2 kW	140 kW
(b) colour changing ..	15·0 kW	186 kW
(2) *Crystal Palace*	2·1 kW	5·5 kW
(3) *Underwater Lighting*		
(a) Boating pool	1·15 kW	12·0 kW
(b) Crescent pond ..	0·6 kW	5·0 kW
(4) *Pylons*	0·64 kW	2·0 kW
(5) *Fountain Tower*	0·8 kW	8·0 kW
(6) *South Bank Mural*	1·1 kW	6·0 kW
Total ..	34·59 kW	364·5 kW

That is to say, the use of fluorescent lighting in this one instance has been responsible for a saving of 330 kW of maximum demand, or approximately ten times the total load on the whole fluorescent installation. This is a major economy.

These important fluorescent lighting developments were planned and put into operation in just over six months from their conception and the installations are the first of their kind in the world.

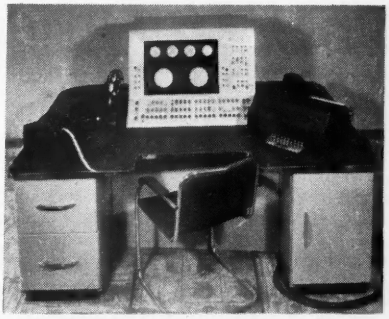
Automatic Digital Computer

Inauguration at Manchester

ON Monday last an automatic digital computer made by Ferranti, Ltd., was officially inaugurated at Manchester University. Throughout the week there has been a conference on the subject which was opened on Tuesday by Prof. F. C. Williams, who dealt with engineering aspects of the Manchester machine.

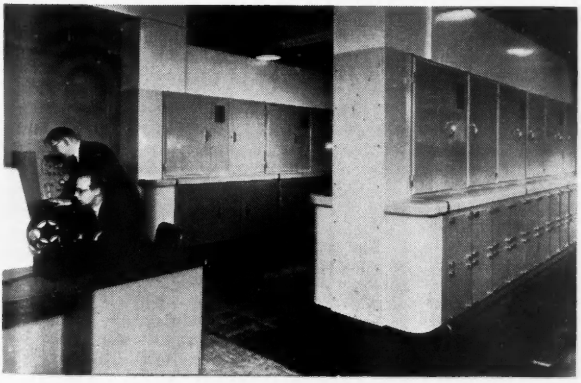
The machine itself was engineered by Ferranti, Ltd., from designs originated in the Electrotechnics Department of the University of Manchester. It was built on behalf of the Ministry of Supply and is housed in a building provided by the Royal Society. It is the latest in a series of machines which have been built in England, in Europe and in America, and in certain respects it is believed to be the most versatile machine so far constructed. These machines are all called digital computers because they work with the ordinary digits of conventional arithmetic and they use as many figures as are needed for the particular computation which they are doing at the moment, so that there is no limit to the precision with which they can work.

All machines of this type can do three things. They can perform all the operations of arithmetic exceedingly fast. For example, a girl with a standard desk calculating machine can do about 600 multiplications of pairs of 10-digit decimal numbers in an average working day. The Ferranti machine will do the same amount of work in two seconds. It can in fact do far more arithmetic in a day than the average man could do in a lifetime and without the same likelihood of error. It can remember many numbers and also the long and elaborate series of instructions which it has to obey in order to perform a complicated calculation automatically. It is believed that the new machine has a bigger "memory" than any other in the world as it can "remember" 16,000 twelve-digit numbers and recall any one of them within one thirtieth of a second.



Control desk of the Ferranti digital computer at Manchester University

It can also make decisions. That is to say, a machine can decide at any stage in the calculation which of two or more contingencies has occurred and determine its future course of operations accordingly. The two alternative courses must of course be prescribed by the mathematician who is working the machine, but, nevertheless, the machine decides between them in the light of the results which it has achieved so far.



Apart from the control cubicle the Manchester computer comprises only these two bays of rack mounted equipment

In other words, it can arrive at results by applying a sort of mathematical version of the game of " Twenty Questions."

The possibility of making such a machine as the one at Manchester was first suggested over 100 years ago by Charles Babbage, who was at the time Lucasian Professor of Mathematics at Cambridge. He was unable to complete it through lack of financial support and because of the inadequate techniques which were available to him, but through the accounts of his work which were written by Lady Lovelace, a daughter of Lord Byron the poet, it is clear that he had a more profound understanding of the principles and possible applications of these machines than anyone else until a few years ago. It is hoped to demonstrate soon on the Manchester machine the solution of a problem which had been studied and solved by Lady Lovelace before the Great Exhibition of 1851.

The first modern machine was made by the International Business Machine Co. in collaboration with Prof. Aiken of Harvard University. This machine was relatively slow because it used telephone type relays, but a second machine built in Pennsylvania University made use of valves and was consequently very much faster.

The new Ferranti machine, however, is in detail quite different from these two machines. It is constructed in two bays each 16ft long by 8ft high and 4ft wide and contains 3,500 valves, 12 cathode-ray tube storage devices (an invention of Prof. F. C. Williams and Dr. Kilburn, both of Manchester University), and a magnetic drum capable of storing 16,000 12-digit numbers.

Problems are put into the machine via teleprinter tape at the rate of 200 decimal digits per second and the machine prints its results on a standard teleprinter. The power requirement of the machine is 27 kW and it is air cooled. It contains 2,500 condensers, about 15,000 resistances, 100,000 soldered joints and about six miles of wire. This particular machine has taken about 18 months to build and Ferranti, Ltd., expect to complete a second machine before the end of the year. They have already started work on a third and propose to manufacture a whole series of machines.

Ripple Control in South Africa

A RECENT ripple control installation by the Automatic Telephone & Electric Co., Ltd., in South Africa provides an interesting example of the measure of load control which can be obtained; in this instance a 25 per cent reduction in the total load.

The installation is at Vanderbijl Park, a new town in course of development about 45 miles south-west of Johannesburg. Its power supply comes from the Electricity Supply Commission's Rand undertaking and the present load is about 5 MW; ultimately a load of 20 MW is envisaged.

At present, the chief industrial user is the Unit Steel Sales Corporation whose works adjoin the large housing estate in which the majority of the employees live. It was found that there was insufficient power available to meet the requirements of both works and domestic users at peak times so the Vanderbijl Park Estate Co. ordered the ripple control equipment.

This performs the following selective functions: 1, water heaters off; 2, water heaters restored; 3, all street lights on at dusk; 4, selected street lights switched off at midnight; 5, remaining street lights switched off at dawn; 6, a general alarm signal; and 7, two spare signals.

Orders have been placed for the supply of contact ammeters which will be arranged to inject load shedding and restoring signals automatically at predetermined trial load values. The number of relays at present supplied or on order is 2,800.

The signal is injected in series with the 11 kV main feeder, a method which ensures that the ripple power may be applied in a manner which energizes only those feeders on which it is desired to exercise control. In this installation, for example, the steel works load is twenty times that of the town, yet the injection equipment, by applying the control current selectively to the latter only, is of a correspondingly reduced size.

Trials of the equipment have proved satisfactory and it was found possible, by selective switching off of the water heater load, to reduce the total load from 4 MW to 3 MW.

Sir John Cass College

The prospectus for 1951–52 is now available for day and evening classes at the Sir John Cass College, Jewry Street, Aldgate, E.C.3, covering mathematics, physics, botany, zoology, chemistry, geology, metallurgy, navigation and arts and crafts. The next term commences on 24th September.

Diesel Electric Cranes

Speeding Up Railway Track Relaying

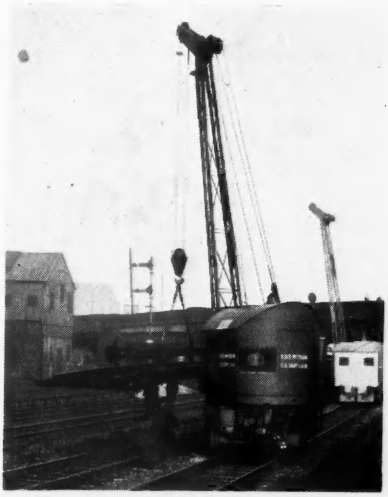
BRITISH Railways (London Midland Region) have ordered ten new 8½ ton diesel electric rail travelling cranes for track relaying and the first seven of these are already in operation. Two cranes working together can take up and relay a mile of line a day.

This new development originated in 1946 when the former L.M.S. started to lay 60ft lengths of pre-assembled track with 10 ton diesel cranes and 7 ton steam cranes. In view of the satisfactory results obtained and with the object of speeding up the work, it was decided to design specially a diesel electric rail travelling crane which would be able to hoist 8½ tons at 15ft radius at 50 ft/min with the crane free on the track, falling to 2½ tons at 33ft radius at 110 ft/min. In addition the crane had to be capable of hoisting 8½ tons at 18ft radius, falling to 3½ tons at 35ft radius when blocked up, and to slew 8½ tons at a speed of 2 r.p.m.

The full range of the jib had to be operated, in or out, in 30 seconds, and the crane had to travel at 3 m.p.h. with an 8½ ton load and have sufficient power to climb a 1 in 40 gradient drawing three loaded wagons, also to be capable of travelling in train formation at speeds up to 45 m.p.h. and to negotiate four chain curves slowly. The axle load of the crane in train formation was limited to 17 tons.

A contract for ten cranes was let in 1947 to Taylor & Hubbard, Ltd., and the outline design was completed. Mounted at one end of the crane undercarriage, the McLaren Ricardo Mk.II three cylinder diesel engine, developing 82½ b.h.p. at 1,100 r.p.m. traction rating, is directly coupled to a Lancashire Dynamo and Crypto 280 V 54 kW compound wound generator. The engine house also accommodates the cooling water radiator, the main fuses, and a generator voltage regulating resistance.

Immediately in front of the driver are the four De Renzi Holmes cam contactor type controllers. Instead of the usual controller operating crank handles a fore and aft lever movement via bell cranks and bevel quadrant brings the four upright levers for the hoist, slew, derrick and travel motions directly in front of the driver.



Diesel electric travelling crane for track relaying

The series wound hoist, derrick and slew motors in the superstructure drive their respective motions through totally enclosed David Brown worm reduction units. Electro-mechanical solenoid brakes are fitted to the hoist and derrick motions, the hoist brake having hand release from the crane driving position. A crane contactor panel provides full protection for all motors. It is possible to operate all four crane motions simultaneously and to avoid overloading the engine a discriminating relay is fitted in the generator field circuit which, on overload, reduces the generator voltage, maintaining constant engine speed.

A B. & A. safe load indicator, operated from the 24 V starter battery, is fitted in the derrick rope. Colour light panels are provided both for the driver and to warn men working at the load. Two 280 V 500 W tubular heaters are fitted at the driving position.

VIEWS on the NEWS

By REFLECTOR

THE Warminster and Westbury R.D.C. has been told by its architect, says the *Western Gazette*, that "the quota of copper was almost exhausted and until April next no further wiring of houses could be done." The chairman said that their houses were all wired for electric cookers and coppers and it might mean the people would have to go to the expense of putting in oil stoves and cookers. It is not clear whose copper quota is exhausted. If the houses are already wired it doesn't seem to relate to the Council; possibly the Electricity Board is unable to provide a service. It seems to me that local authorities should be sure of a supply for their tenants before wiring houses, but it is a sign of the present bad times that the use of imported oil has to be contemplated because people cannot get home-produced electricity.

* * *

Although the British Electricity Authority has now been in existence for over three years a newspaper of the standing of the *Observer* can still refer to it as the "Central Electricity Board." It says of this defunct body that, while paying lip-service to the importance of economy, it "clings to the antiquated idea that its job is to sell all the current it can." Our contemporary falls into the common error of regarding electricity as an extra to coal instead of an efficient substitute for it. Moreover, it is surely true economy to sell all the electricity possible, out of peak hours, to ensure that the generating plant is fully used and coal is saved.

* * *

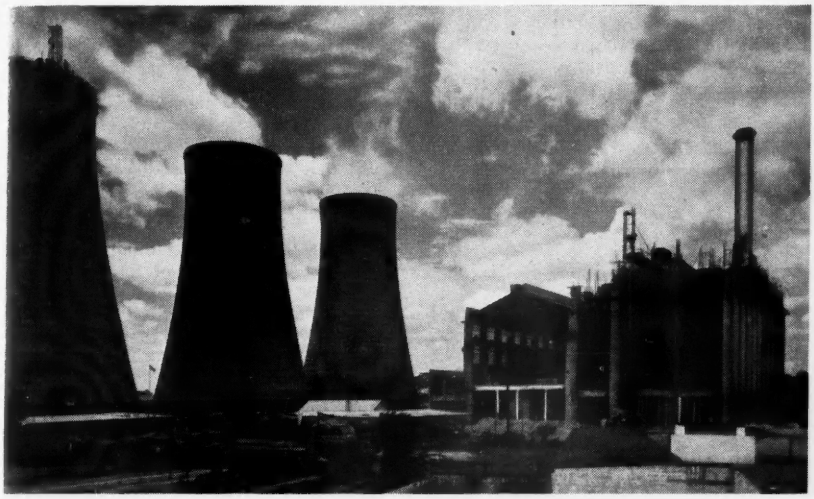
In a number of towns in this country buses are replacing trams, but the uncertain future of oil supplies must raise a doubt whether this policy is not a short-sighted one. There will be many, I am sure, who will support the view which Mr. E. R. L. Fitzpayne, general manager of the Glasgow Corporation Transport Department, expressed at the Congress of the International Union of Public Transport held in Edinburgh, that electric transport is obviously the type of the future. He finds it hard to accept the employment of tankers to ship diesel fuel or petrol from overseas when electricity, whether supplied from coal or water, is on the doorstep. In the future, too, electricity derived from atomic energy is a certain development, further justifying its unlimited use in public transport. Mr. Fitzpayne believes that double-deck vehicles are probably already obsolete and attributes to their slavish adoption in this country the fact that the tramcar here does not have the same advantages as abroad where trailers are widely used.

* * *

A Bathavon woman recently complained to the Rural Council that she had received a shock while cleaning the door and steps of her aluminium "prefab." As a consequence the Council is investigating the possibility of shock risk to tenants of these aluminium houses which are equipped with asbestos composition water pipes. The *Bath Chronicle and Herald*, quoting "a well-known local electrical expert," says that people in Bath prefabs need have no fear of electric shocks for in these iron pipes are installed and these provide efficient earthing. On the other hand "asbestos pipes do not make a very good earth." This is a patent understatement I think.

* * *

Lest the reference last week to "The Housing Manual, 1949: Technical Appendices" be perplexing I hasten to explain that it was indistinct telephony which resulted in my being made to observe that no more than "four pages"—whereas in fact only four lines—are included about standards of artificial illumination in the home. What I had intended to imply was that modern household lighting demands something more in the way of circuit wiring and switching than that which sufficed for the bygone idea of a single ceiling rose in each room.

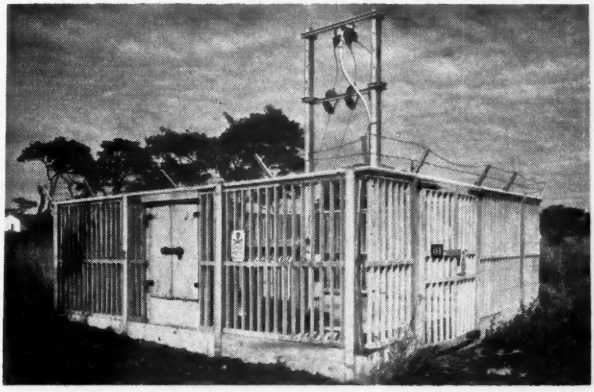


Electricity in Rhodesia

Progress of the Salisbury Municipal Undertaking

IN the financial year immediately prior to the last world war the Municipal Electricity Department of Salisbury, Southern Rhodesia, sent out 23 million kWh and the peak demand was 8,000 kW. In 1950 those figures had risen to over 112 million kWh sent out and the demand to 37,500 kW, while the winter demand this year is expected to be approximately 46,000 kW. The increase indicated, however, has not been steady in that 80 per cent of the total growth has occurred since the end of the war.

In 1939 the city and its environs had 3,800 consumers, each using an average of 470 kWh a month, whereas in 1950 there were over 10,000 consumers using an



Above: **Construction work in progress on the second stage of the Salisbury No. 2 power station.** *Right:* **A rural outdoor substation with concrete fencing and distribution pillar**

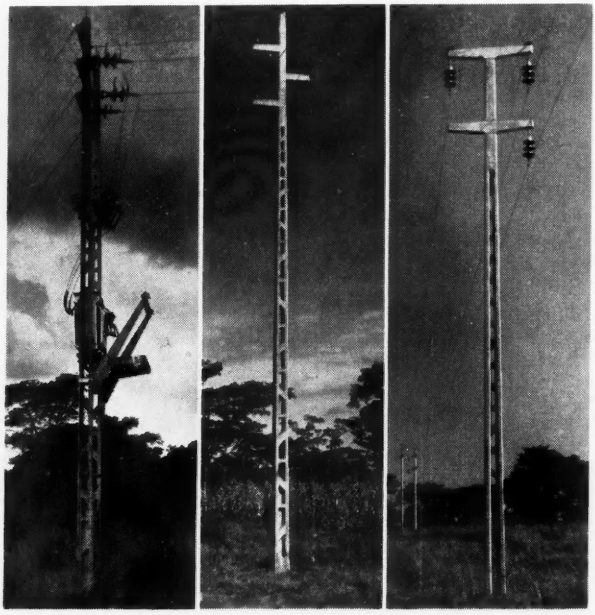
average of 930 kWh monthly. Thus the number of consumers has more than doubled and the use to which electricity is being put by them has also more than doubled, making the overall demand nearly five times that of 1939.

Fortunately a certain amount of this increase had been anticipated by the city electrical engineer, Mr. J. E. Mitchell, B.Sc.Tech., M.I.E.E., M.I.Mech.E., and the City Council had decided to inaugurate plans for a new power station in 1941. The first stage, consisting of two 7,500 kW sets and two 87,500 lb/hr boilers, costing approximately £600,000, was put into operation in 1946.

Immediately the first stage was in commercial operation it was decided to order the second stage, consisting of two 10,000 kW sets and three boilers similar to those of the first stage and costing approximately £1,000,000; but, owing to the enormous demand for new boilers and turbines of which the whole world had been starved during the war, no better deliveries could be obtained than would put the second stage into operation earlier than 1952. Thus, although the first stage was ordered and erected during four war years, it was running two years sooner than plant ordered since the war can be expected to be put into operation.

To allow for the long deliveries the City Council has already agreed to proceed with the third stage extensions, consisting of two 20,000 kW sets and four 100,000 lb/hr boilers at a cost of a further £1,800,000. In short, the Council's far-sightedness has been responsible for the Department being able to deal with the unprecedented growth of the demand up to the winter of 1950 when the Department had to institute a small amount of load shedding. It was impossible to foresee the world-wide bottle-neck in boiler plant which has made certain restrictions necessary, but a link with the Electricity Supply Commission's power station at Umniati by the erection of 90 miles of 88 kV transmission line, completed in May, should remove the necessity for load shedding and the Department should be able to take care of any demand that is likely to be made upon it.

Financially, the Department is on a very sound footing, but owing to the price of almost every type of material used and the cost of labour having approximately doubled and in some instances trebled over the last decade, the tariffs had to be raised in 1948. The average price per kWh obtained in 1950 was, however, still less than was obtained in 1939, being 1·1d/kWh now as against 1·2d at that time. Considering the present-day value of the pound and the fact that over 80 per



Left: **Pole transformer installation with pre-cast concrete support for platforms and concrete cross-arms.** *Centre:* **An 11 kV pole line also with cast arms.** *Right:* **A 33 kV pole line, cross-arms cast with pole**

ent of the development of the undertaking as been carried out during a period of xtremely high prices, this is something of n achievement.

The Department supplies electricity to n area of approximately 3,000 square niles around Salisbury. From remarks assed by visitors from many countries, it vould appear that the electrification of this rea is as far advanced as it is anywhere.

Because of the prevalence of termites, vood poles for overhead line supports are ot favoured and when the advent of war nade it difficult to obtain steel, the Depart-nent had to look elsewhere for suitable ypes of overhead line supports.

All types of concrete poles used were lesigned entirely departmentally and a nethod of manufacture was evolved which has been patented in South Africa and the United Kingdom. It is estimated that the saving to the Department of this develop-ment to date has been £250,000 compared with the cost if steel forms of support had had to be used.

Not only are overhead line poles of from 28ft for low voltage lines to 45ft for 33 kV lines produced, but concrete rails and gates for outdoor substations, concrete distribu-tion pillars, concrete cable boxes and numerous other small items for varying uses are also manufactured.

In view of Salisbury's tree lined streets, public lighting has always encountered difficulties. As an answer to this problem the new "Salisbury" pole, with its 17ft overhanging arm, has been produced.

The residents of the city are very elec-trically minded, practically every house being equipped with electric lighting, cooking, water heating, refrigerators and radiators, while the sale of washing machines, floor polishers, etc., is proceeding rapidly.

Cast concrete "Salisbury" street lighting pole

Unfortunately, at least for the Electricity Department, the majority of the population do all things at the same time, causing a very "peaky" load, especially in the winter. In order to combat this un-desirable and expensive feature, the Depart-ment will shortly be installing the first ripple control of water heating and street lighting in Africa, when it is hoped that the load curve may be considerably flattened.

North of Scotland Mobile Showroom

THE North of Scotland Hydro-Electric Board has put into service a mobile showroom designed for use in the isolated parts of the area where electricity is being supplied for the first time. It will be driven to isolated farms and crofting townships and connected by cable to the overhead lines. Because of the narrow roads over which it will be required to travel, the size of the van had to be restricted. This was overcome by providing telescopic sides which expand to form bays in which equipment can be displayed.

Internal wiring enables the equipment, which normally will include an electric cooker, washing machine, vacuum cleaners, fires, irons, kettles and lights, to be shown in operation. There is a 50 gall cold water tank and a 25 gall hot water tank heated by electricity. A 20 gall tank is provided for waste water. This will enable washing and ironing demonstrations to be carried out. A girl demonstrator will accompany the van when it is on tour. There is accommodation for 12 people in the van but there is provision for the erection of an awning so that larger audiences can see the demonstrations.

Harnessing the Zambesi

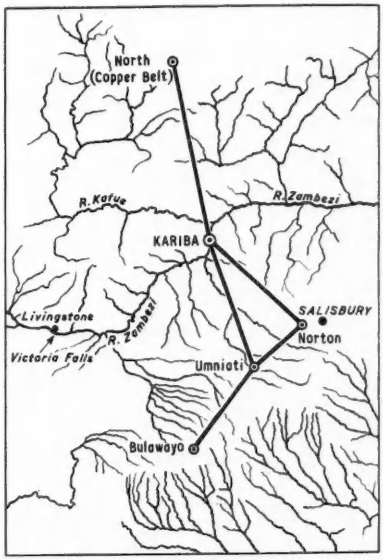
Favourable Report on Rhodesian Project

CONDITIONS for a large hydro-electric development on the Zambesi River at Kariba Gorge are "unusually favourable" in the opinion of an advisory panel of consulting engineers who have been investigating the project. They add that, when it is fully developed, the cost will be low by any known standard.

Following an investigation at Kariba five years earlier by the Electricity Supply Commission of Southern Rhodesia, the Central African Council in 1946 set up an Inter-Territorial Hydro-Electric Power Commission, under the chairmanship of Mr. A. B. Cowen, O.B.E., M.I.E.E., to study the Kariba and Kafue schemes, together with other large sources of power, for joint development by the Governments of Northern and Southern Rhodesia.

For the purpose of assessing the relative merits of the Kariba and Kafue schemes the Commission in 1948 appointed an advisory panel of four consulting engineers, namely, Sir William Halcrow, M.Inst.C.E., M.I.Mech.E. (Sir William Halcrow & Partners), chairman; Mr. H. J. F. Gourley, M.Eng., M.Inst.C.E. (Binnie, Deacon & Gourley); Mr. C. H. Pickworth, M.Inst.C.E. (Preece, Cardew & Rider); and Mr. G. E. Kennedy, M.A., M.I.Mech.E., M.I.E.E. (Kennedy & Donkin). The Commission's report, with the general conclusions and recommendations of the consulting engineers, has now been published by the Central African Council and is available from the Crown Agents for the Colonies, price £3 3s.

These two projects are so sited in relation to the power consuming centres, and on investigation "disclosed a power potential of such magnitude" that other possible developments on the Zambesi were not studied. There are, however, in addition to the Victoria Falls, promising sites downstream. The Kafue River scheme (maximum 380 MW) is considered inadequate as an initial development and it is suggested that it should be regarded as a future extension of Kariba.



Site of the proposed development; the transmission lines shown are diagrammatic only

The Kariba Gorge, through which the river flows with a negligible fall, is some 16 miles long and the catchment area above it is estimated at 206,000 square miles. Various sites for a dam were considered and one at the lower end has been provisionally selected. At this site, with a top water level of 1,644 R.L., the ultimate capacity is estimated at 1,000 MW at 70 per cent annual load factor. A dam about 1,230ft long and 460ft high would be built across the gorge, with the power station immediately below the dam. It is proposed that the scheme should be carried out in two stages, the initial installation, in 77 MW sets, being 385 MW and the final installation (thirteen main sets and one stand-by) 1,078 MW, with two 5 MW house sets. Based on prices last November, the initial installation is estimated to cost £43·5

million and the completed scheme £74·5 million. Construction, from the date of authorization to the delivery of power at the consuming centres, is expected to take eight years.

The Commission is satisfied that the load development estimates in the territories to be served are sound, and that the Kariba scheme affords the most economic source of bulk power. The immediate potential load in Northern Rhodesia from the copper companies alone is about 100 MW. In Southern Rhodesia the demand of the Salisbury–Midlands area is expected to be between 270 and 380 MW in 1962, while the Shabani, Gwanda and Bulawayo areas, in the aggregate, afford a similar potential load.

Low-Cost Power

The Commission's report, which is now being considered by the Governments of Northern and Southern Rhodesia, states that if the project is carried out it will enable hydro-electric power to be delivered at receiving stations at a cost of 0·2525d/kWh for the initial development and at 0·1703d/kWh for the ultimate scheme. This compares with an estimated cost of thermal power in the Salisbury–Midlands area of 0·477d/kWh in 1961 and 0·41d/kWh in 1971. Assuming that the initial stage of the Kariba scheme is completed by 1961 and the whole by 1971, the total saving over this period would be £23 million, and afterwards would be at least £4 million a year. There would also be considerable saving of national capital in such matters as coal, transport and water.

Control of the undertaking, it is recommended, should be in the hands of a Rhodesian Hydro-Electric Power Authority with appropriate territorial representation. The Authority would own the works at Kariba together with the transmission lines and associated apparatus, and would sell bulk power at cost. The advisory panel suggested a transmission voltage of 220 or 275 kV and the Commission recommends that a 220 kV ring system should be adopted, transmitting power initially to the copper fields of Northern Rhodesia and the Salisbury–Midlands area of Southern Rhodesia.

Regarding communications, the Commission points out that if it is decided to proceed with the scheme and complete it by 1961 a rail or road connection with the site of the dam will have to be provided by 1954–55. As it is in the area of a proposed railway link between Sinoia and Kafue, the Commission is of the opinion that the Authority should bear only the cost of any rail spur to the site.

On the wider question of exploiting the resources of the Zambesi, it is recommended that a Zambesi River Authority should be set up to collect, study and disseminate information about the river and to act as an international water court. To this end it is suggested that a conference of the countries having a direct interest in the use of the waters of the river should be convened as soon as a decision has been reached on the recommendations in the report. The Zambesi rises in Portuguese West Africa (Angola) and discharges in Portuguese East Africa, in its course affecting the riparian and other interests of South Africa, South-West Africa, Bechuanaland, Northern Rhodesia, Southern Rhodesia and Nyasaland.

The Commission records with regret that during the course of the investigations an unprecedented cyclonic rainstorm dislodged a mass of rock above the base camp at Kariba Gorge, causing the deaths of Mr. G. P. Ward, assistant secretary of the Commission, and of Mr. E. Bellamy and Mr. H. Lucas, of the Southern Rhodesia Irrigation Department.

Soil Warming

A 12-page illustrated brochure (E.D.A. 1705) produced by the Electrical Development Association is entitled "Electric Soil Warming for the Commercial Grower." There is now a wide range of applications of soil-warming equipment covering the whole field of growing where "unseasonable" temperatures are required. In each of the main ways of applying soil warming there is again a number of variants depending upon local and personal requirements and conditions. It is not possible to describe all these variants without devoting a considerable amount of space to the matter, but the brochure gives a general picture of the main classifications to enable the grower to decide whether to ask for more detailed information. The illustrations, which have been specially prepared for this new publication, show clearly the disposition of the electrical components. Copies can be obtained from the Association at 2, Savoy Hill, London, W.C.2, or from local Electricity Service Centres.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Brush ABOE group of companies has announced the following appointments :— **Mr. J. Ayres,** M.I.E.E., M.I.P.E., for the past five years works director (Loughborough) of the Brush Electrical Engineering Co., Ltd., to be general manager (local) of Petters, Ltd., Staines; **Mr. C. F. Barnard,** who was seconded to the National Gas & Oil Engine Co., Ltd., last September and previously was assistant general manager of Mirrlees, Bickerton & Day, Ltd., to be assistant general manager, National Gas; **Mr. E. J. Batchelor,** managing director for the past four years of Brush Coachwork, Ltd., and A. C. Morrison (Engineers), Ltd., to be vice-chairman of Brush Coachwork, Ltd., and director and general manager of Henry Meadows, Ltd.; **Mr. K. N. Eckhard,** M.I.E.E., M.Inst.T., M.I.Loco.E., former chief electrical engineer of the Central Argentine Railway, to be director and general manager of Brush Bagnall Traction, Ltd.; **Mr. B. D. Giordan,** B.Sc., A.M.I.Mech.E., who joined the group in 1948, to be general manager of Mirrlees, Bickerton & Day, Ltd.

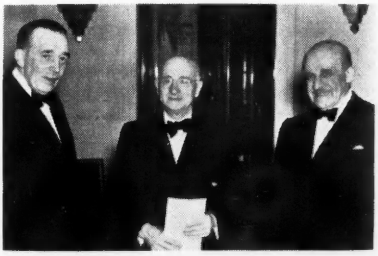
Mr. G. B. Pierpoint, A.M.I.E.E., A.M.I.I.A., has been appointed manager of the Wembley District, Northmet Sub-Area, Eastern Electricity Board, as from 1st August. Mr. Pierpoint received his technical training at the Manchester College of Technology and joined the Manchester Corporation Electricity Department in 1926. In 1929 he became a development engineer with the Scarborough Corporation Electricity Department, and in 1936 consumers' engineer with the South Shields Corporation. He was appointed deputy borough electrical engineer at South Shields in 1939 and was in that post upon the nationalization of the undertaking. In February, 1949, he was appointed manager of the Huntingdon District, and leaves this position to take up his new appointment.

Commander C. F. Nock, R.N.(Ret.), lately sales director of the Tuscan Engineering Co. and formerly sales manager, Hopkinson Electric Co., has resumed naval service and has been appointed to the staff of the Admiral Commanding Reserves.

Mr. J. E. M. Johns, general manager of the Valve Division of Mullard, Ltd., has resigned from the company. He was with the Mullard organization for twenty-four years, having joined its sales department in 1927. Mr. Johns' private address is "Tree Tops," The Ridgeway, Radlett (telephone : Radlett 6785).

Colonel A. G. Woods, D.S.O., M.C., M.I.Mech.E., A.C.C.S., who has been secretary of the No. 7 Sub-Area of the North Western Electricity Board since shortly after vesting day, reaches retiring age on 25th July. Before nationalization he was well known in the electricity supply industry in the north west as the wayleaves officer for the Central Electricity Board.

Nearly 300 guests attended the overseas reunion dinner of the **General Electric Co., Ltd.,** held at Claridges on 28th June. Sir



Mr. Leslie Gamage (*left*), **the Rt. Hon. J. B. Chandler, Lord Mayor of Brisbane, and Sir Harry Railing at the G.E.C. overseas reunion dinner**

Robert Menzies, chairman of the British India Corporation, was the guest of honour and replied to the toast of "The Guests" proposed by Sir Harry Railing.

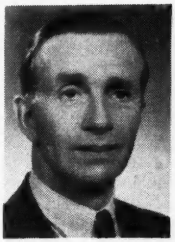
Mr. W. J. Terry has been appointed president of the British Non-Ferrous Metals Federation for the year 1951-52.

Mr. R. J. Hunt has succeeded **Mr. J. H. W. Pawlyn** as chairman of Ransomes, Sims & Jefferies, Ltd. Mr. Pawlyn remains a member of the board.

Mr. F. W. Lobenhoffer, managing director of Bennyhill (Engineers), Ltd., has been appointed president of the North Staffordshire Branch of the Association of Mining Electrical and Mechanical Engineers.

Mr. A. Comar Wilson has been elected a director of Associated Electrical Industries, Ltd.

The Metropolitan-Vickers Electrical Co., Ltd., has appointed **Mr. J. P. A. Meldrum**, O.B.E., B.Sc., M.I.E.E., as special assistant, Sales Management, and **Mr. J. E. Stubbs**,



Mr. J. P. A. Meldrum

Mr. J. E. Stubbs

B.Sc., A.M.I.E.E., as sales manager, Switchgear Department.

Mr. Meldrum was educated at Rugby and Glasgow University. After a vacation apprenticeship with Metropolitan-Vickers in 1924, he joined the company as a college apprentice in 1926. Subsequently he became a special switchgear trainee and in 1930 he was appointed to the staff of the Switchgear Engineering Department. He visited Australia, New Zealand and the United States in 1939. During the war Mr. Meldrum served in the Royal Corps of Signals, attaining the rank of lieut.-colonel. In 1942 he rejoined the M.-V. Switchgear Department of which he became sales manager in 1946.

Mr. Stubbs was educated at Bristol University and after a college apprenticeship and a period in the switchgear drawing office at Trafford Park, he spent eight years with the M.-V. agents in Cairo, where he acted as the company's engineer on the North Delta pumping stations contract. In 1939 he joined the tendering section of the Switchgear Engineering Department. He became assistant to the sales manager, Switchgear Department, in 1948 and assistant manager in 1950. Mr. Stubbs has made many visits abroad, notably to Portugal and Spain in connection with hydro-electric work. Since the war he has been to Germany as a member of a B.E.A.M.A. team for the study of German switchgear, and towards the end of 1950 he made a tour of Australia and New Zealand.

Mr. G. K. Moss, who has been with Lindsay & Williams, Ltd., for over twenty years, has recently been appointed managing director.

Last Saturday was Parents' Day at the Willesden Works of the **British Thomson-Houston Co., Ltd.** After a reception in the Old Vicarage grounds there was a tour of the works, followed by tea in the staff canteen. The visitors were welcomed by Mr. H. E. Cox, manager of the works. Comments on the essay competition were made by Mr. H. Trencham, consulting switchgear engineer, the awards being presented by Mr. E. S. Little, secretary and comptroller, B.T.H. Co. The results of the drawing office examination were announced by the apprentice supervisor. A vote of thanks was proposed by Mr. B. J. Balkwill, acting chairman of the Apprentices' Association.

Keen inter-departmental rivalry in friendly spirit was a feature of **W. Canning & Co.'s** sports held on 30th June under ideal weather conditions at their new ground in Lonsdale Road, Birmingham. The London team, who arrived in full force, carried away many of the honours, including the veterans' race (won by H. Cann) and the tug-of-war. Although not taking part as a team, the Sheffield branch was well represented by individual members. Side shows and amusements included a treasure hunt.

During her visit to the **Royal Show,** Cambridge, on Thursday last week, Her Majesty the Queen inspected "Electricity Farm" and spent fully ten minutes looking at the domestic, agricultural and horticultural equipment on display. On arrival at the farm, the Queen was received by Mr. C. T. Melling, chairman of the Electrical Development Association and of the Eastern Electricity Board, who jointly organized the exhibit. Mr. Melling presented to Her Majesty Mr. P. Sydney, commercial officer of the Fens Sub-Area, Eastern Electricity Board, Mr. E. M. Ackery and Mr. R. A. Bayetto, both of the E.D.A. London staff.

The Queen also inspected the kiosk arranged by the Electrical Association for Women, with models of the kitchens of 1851 and 1951 which

Her Majesty the Queen with Mr. Melling at "Electricity Farm." In the background is Mr. E. M. Ackery (E.D.A.)

formed part of the E.A.W. Festival of Britain exhibition. At this part of the farm Mrs. Melling, Mrs. Mathias, E.A.W. organizer, and Mrs. Messenger, adviser on women's work to the Eastern Electricity Board, were presented to the Queen by Mr. Melling.

Mr. T. Nolan, accountant to the No. 4 (Leeds) Sub-Area of the Yorkshire Electricity Board, has been elected junior vice-president of the N.A.L.G.O.

More than 1,000 employees of **Oldham & Son, Ltd.,** received a gift of 12s 6d each as "spending money" when they went to Blackpool in two special trains on 30th June for an expense-free day's holiday. In addition, everyone had admission tickets to various places of amusement. Luncheon at the Winter Gardens was presided over by Mr. S. J. Wrigglesworth, director and general manager. Mr. John Oldham, O.B.E., J.P., chairman and joint managing director of the company, was present with his brother, Mr. Edward C. Oldham, joint managing director. A civic welcome was given by the Mayor and Mayoress of Blackpool.

A new clubhouse with a fully equipped sports pavilion has been presented to the **Ekco Social & Sports Club** by the management of E. K. Cole, Ltd.

OBITUARY

Sir Theodore Thomas.—The death occurred on 3rd July at the age of sixty-nine of Sir Theodore Thomas, C.B.E., M.Inst.T., who played a leading part in the development and expansion of London's transport system. Sir Theodore (then Mr. T. E.) Thomas entered the drawing office of the London United Tramways in 1899 at a time when the horse tram services were being converted to electric traction. Subsequently he was appointed resident district engineer. When control of the company passed to the Underground Group he transferred to publicity and commercial work and in 1913 became commercial assistant to Mr. Frank Pick.

The late Sir Theodore Thomas

In 1917 he left the Underground Group to become development superintendent of the L.C.C. Tramways, becoming traffic manager in 1925 and general manager in 1930. On the establishment of the London Passenger Transport Board in July, 1933, he was appointed general manager of the Board's tramways in the central, southern and eastern districts, and general manager of the entire tram and trolleybus system in the following October. In 1936 he became responsible also for the operation of buses, with the title of general manager (road transport), and three years later of railways as well as road services, with the title of general manager (operation). Finally, in 1943, he was appointed general manager of the board, from which position he retired in 1945.

Mr. Thomas was made a C.B.E. in 1941 and received a knighthood in 1946. Among important offices he held were the presidency of the Institute of Transport, of which he was a foundation member and a gold medallist, and the chairmanship of the Public Transport Association.

Mr. L. J. Couves.—The death has occurred at the age of seventy-two of Mr. Leonard J. Couves, senior partner in the firm of L. J. Couves & Partners, architects, Newcastle-on-Tyne, who have for some years carried out architectural work in connection with new power stations in the north-east and are at present engaged on plans for the new Stella-on-Tyne power plant.

Mr. W. H. Wigston, director of the Electrical Division of Britannia Engineering Co., Luton, died suddenly on 26th June. Before joining the company in 1949 he served for more than twenty years with the British Thomson-Houston Co., Ltd., latterly as assistant manager of the Lighting Department. For about ten years, up to 1949, he was chairman of the Electric Discharge Lamp Auxiliaries Council, and in addition served on many committees of the Electric Light Fittings Association. For three years he was a member of the Electrical Fair Trading Council.

Mr. W. P. Brantingham.—The death has taken place at the age of seventy-two of Mr. William Philip Brantingham, who for over fifty years was a partner in the firm of Brantingham Bros., electrical engineers, Sunderland.

Mr. H. C. Mills, managing director of the Morgan Crucible Co., Ltd., died suddenly on 27th June.

WILLS

Mr. F. F. Robinson, M.I.E.E., a former senior technical officer with the London County Council, who died on 17th December last, left £6,184 gross (£6,115 net).

Mr. W. Bradley, former head of W. Bradley & Son, electrical engineers and contractors, who died on 13th February last, left £2,806 gross (£2,735 net).

Mr. W. E. Lane, M.I.E.E., late London manager of the Electricity Trust of South Australia, who died on 20th April, left £648 gross (£608 net).

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

A Contractor at the Convention

AS an interested listener to the papers at the B.E.P.C. at Brighton I was disappointed that so little mention was made of the use of atomic energy as a means of producing electric power. Presumably the B.E.A. has a committee studying this subject, but at the Convention no mention was made of its work and, in fact, it appeared that the engineers responsible took the attitude that coal was good enough for our fathers and it was therefore, good enough for them. I feel sure that this impression is wrong and I therefore consider that the industry should be kept informed of the progress being made—and where could this be done better than at the Convention?

I also listened with interest to Sir Henry Self's exposition of the weakness of nationalized industries where finance was concerned, but one can understand the attitude of the Treasury when such large capital sums at the disposal of the B.E.A. are utilized by the Area Boards for equipping retail shops and contracting departments, and financing hire-purchase transactions, instead of for the purpose of improving power production and distribution.

In case anyone thinks I am biased in this matter, may I sign myself

PRIVATE ELECTRICAL CONTRACTOR

[The uses of electricity was the theme of the Convention this year, means of production having been dealt with last year.—Eds.]

Automatic Control Conference

AT a conference on the theory and use of automatic control to be held at the College of Aeronautics, Cranfield, near Bedford, from 16th to 21st July, leading scientists and technicians from many countries are discussing the latest advances in this field, in which Britain has made major contributions. The objects are to stimulate and assist in the increase of knowledge on this subject which is of great importance to industry. Sir Ben Lockspeiser is to open the conference and 32 technical papers will be presented by scientists from Canada, France, Germany, Holland, Sweden, Switzerland and the United States.

The wartime uses of automatic controls provided a big stimulus to their use in industry and considerable advances have been made since the war. All automatic control involves a common principle which can be defined as the control of a variable by comparing the value measured with the value desired and making correction accordingly.

Although the principles of automatic control are simple, their application to particular jobs is often a difficult and highly technical task. It may be done by trial and error, but this is a lengthy and costly business. Research workers have, therefore, been studying the theory of automatic control, to obtain formulae from which technicians will be able to design controls for particular processes both rapidly and comparatively cheaply. This is largely a matter of mathematics so the papers and discussions at the conference which are mainly concerned with theory will be preponderantly mathematical.

Joule Museum Opened

JOULE HOUSE, Salford, where the celebrated physicist James Prescott Joule lived for many years, and now the property of Salford Corporation, has been converted into a Joule Museum. Here are displayed laboratory notebooks, examples of the apparatus used by Joule in his experiments, some of which has been provided by the Manchester College of Technology, and other personal "relics."

The establishment of the museum was celebrated by a public lecture delivered at Manchester University on 3rd July by Dr. L. Rosenfeld, Professor of Theoretical Physics, on "Joule's Scientific Outlook." In this the speaker outlined the work and views of the scientist, referring to his study of the heating effects of electric currents and his determination of the mechanical equivalent of heat.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Thermolain" coffee percolator elements.

"Magnum Healatone" infra-red appliances.

General inquiries rom readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Indian Power Plans

Committee to Examine the Kosi Project

THE Government of India has appointed an advisory committee to examine and report on the Kosi irrigation and hydro-electric project. The chairman of the committee is Mr. S. C. Majumdar, consulting engineer to the Government of West Bengal, other members being Mr. N. P. Gurjar, lately chief engineer (irrigation) to the Government of Bombay; Mr. G. Sundaram, chief engineer (electricity), Madras; Mr. M. P. Mathrani, additional chief engineer, Bihar; and Mr. B. S. Nag, project officer, Central Water and Power Commission.

The third largest of the Himalayan rivers, the Kosi flows through Nepal and Bihar. Apart from the havoc caused by flooding, the frequent changes in the river's course result in large areas being laid waste. Investigations began in 1946 with the object of devising a plan to stabilize the river channel and to control flooding and silting, at the same time harnessing the flow for irrigation, power generation and navigation. It was found that to do this it would be necessary to build a dam 783ft high above the foundation rock and a barrage some five miles lower down. The power available was estimated at 1·8 million kW and the entire project costing some Rs 177 crores (£132·7 million) would take 14 to 16 years to complete.

Because of the cost it is proposed to divide the scheme into stages. The first is estimated to cost Rs 10·5 crores (£7·9 million) and comprises a railway line from Jogbani to Barakshetra, near the site of the dam; the barrage; a power channel up to No. 1 power house; two 10,000 kW units; and the first instalment of the necessary transmission lines.

Madras Programme

At a Press conference last month the Minister of Public Works, Madras, reviewed the progress of the various irrigation and electricity projects in the State and Mr. G. Sundaram, the chief engineer (electricity) explained the programme for the next two or three years. He said that in 1952 the Electricity Department expected to install three 12,000 kW units at Moyar and in 1953 to add two units totalling 26,000 kW at Pykara. It was also expected that the first unit would be brought into commission at Machkund and that the capacity of the Madura thermal station would be increased by 15,000 kW.

During the year covered by the latest report of the Madras Government Electricity Department (1949–50) expenditure on new projects and extensions was greater than in any previous year at Rs 5·64 crores (£4·2 million). Because of water shortage in the hydro-electric areas and lack of sufficient generating and transformer capacity generally it was necessary to confine load development for the most part to agricultural pump sets and essential industries. However, the aggregate power demands on the Government system rose from 121,975 to 129,137 kW and kWh generated from 569·4 million to 605·8 million. Of the 256,869 electricity consumers in the State 247,026 were served by Government undertakings.

Municipal Opposition

Recent action by the Government to acquire further undertakings has given rise to opposition among certain municipal councils. One of these, the Madura municipality, applied to the High Court and was granted an interim stay of the Madras Government's order for the vesting of the Madura undertaking in the Government under the Madras Electricity Supply Undertakings (Acquisition) Act.

During March last 474·5 million kWh was generated and purchased by public utilities in the Indian Union, compared with 414·9 million in March, 1950.

Indian Engineers

THE report of the Bombay Centre of the Institution of Engineers (India) records an increase in membership from 1,035 in 1949 to 1,168 last year. The four engineering sections were reconstituted during the year, including an electrical section under the chairmanship of Dr. B. K. R. Prasad. The report is printed with the text of eight papers for presentation during the twenty-ninth session.

Industry and the House

Final Stages of Finance Bill

By F. J. ERROLL, M.A., A.M.I.E.E., M.P.

THE mood of the House had changed for the Report Stage of the Finance Bill which was discussed on 28th June and 2nd and 3rd July. The Opposition was anxious to avoid the all-night sittings which had been a feature of the Committee Stage of the Bill. In consequence business was disposed of fairly rapidly, although the Chancellor was not prepared to make very many concessions.

Proceedings opened, however, with a small but welcome concession giving relief from the duty on light hydro-carbon oils used in processes for the manufacture of export goods. Hitherto drawback of duty has only been permitted where an ascertainable amount of oil has been actually exported in the finished article. Now drawback will be obtainable in certain cases where the oil is used up in the manufacture of the exported article.

A strong plea was made by Mr. Hollis for personal removal expenses to be allowed as an expense when a person is compelled to change his residence in order to pursue his employment. The Economic Secretary to the Treasury was compelled to resist the proposal although he felt sympathy with the object. He said it would be difficult to define those removal expenses which would be permitted and those which would not. There was a whole host of real difficulties, quite apart from the point of principle.

Death Duties and Private Businesses

Mr. Nigel Birch moved a new clause, which had not been called last year, designed to give relief to small businesses which suffer heavily from death duties when the owner or one of the principal shareholders dies. Formerly such a business was valued at the notional price it would be likely to fetch in the open market, and death duties were paid accordingly. Under the 1940 Finance Act that basis was altered and such a business fell to be assessed at the net value of the assets. Mr. Birch's new clause would give the option to the representative of the deceased owner to be assessed either under the Act of 1894 (the original Act) or under the Act of 1940.

Several Members supported the case by pointing out that the value of a business was usually much greater than the value of the assets alone. Furthermore, when such a business was turned into a public company with a Stock Exchange quotation for its shares the market value of these shares was accepted by the Inland Revenue as being the value for death duty purposes. It seemed hard that a private business should be called upon to pay more in death duties than a business which was larger. Members also pointed out the crippling effect on some small self-owned businesses when a large sum of cash had to be found to meet death duties.

Clause Resisted

Mr. Edwards, in resisting the clause, said that, because statements continued to be made about the hardship caused, the Inland Revenue made an investigation into the matter. The investigation showed that there were about one hundred cases a year which could be regarded as hardship cases, that was to say, any cases in which the estate duty on the total assets exceeded the non-trading assets so that some part of the duty would have to be found out of the business. The report showed that in 60 per cent of the cases less than 25 per cent of the business assets were required to pay the duty and in only 17 per cent did the duty swallow more than 50 per cent of the business assets. Only 19 per cent of the cases examined were manufacturing concerns. Mr. Edwards considered that it was too early to consider any special relief. He maintained that there were good reasons which led the Government in 1940 to remedy what were thought at the time to be defects in the law.

A debate on initial allowances revealed the Chancellor in unbending mood. Apart

from the concession which he had announced in the form of an amendment to include ships already ordered, as well as those under construction, he was prepared to give nothing away.

In the Committee Stage the Opposition had taken great exception to Clause 29 which covered transactions designed to avoid liability to profits tax. This clause was debated for over twelve hours. On the Report Stage the Attorney-General came along with five amendments designed to reduce the objections to the clause. The Commissioners will now have to give reasonable information about the matter covered by any particular direction that they make. The issue of debentures will not give rise to the risk of a direction being made. Also it will now be possible to get an indication in advance from the Commissioners whether they would make a direction in relation to any future transaction as well as to any transaction which had taken place in the past.

On the Third Reading of the Bill Mr. Gaitskell and Mr. Jay, the Financial Secretary, both referred to the present tendency to increase dividends. Mr. Jay said that company reports since April had shown that the increase in the distributed profits tax had certainly not been too large. If it failed in its purpose to prevent further increases in dividends the Government would be compelled, in order to restrain inflationary pressure, to find some other method of keeping dividends down.

PARLIAMENTARY NEWS

From Our Special Reporter

IN the House of Commons last week Col. Banks moved to annul the Nickel Prohibited Uses (Ministry of Supply) Order, and the Nickel Prohibited Uses (Board of Trade) Order. He said he understood that this year there would be a shortage of nickel and that next year the shortage would be worse. In taking into consideration the allocations for the future, had due regard been paid to the reduced quantities of nickel which would be consumed as a result of other raw material shortages which would make it necessary for manufacturers to curtail their programme? In the list of goods which could not be nickel-plated after the due date there were certain anomalies. For instance, in future it would be possible to nickel-plate the radiator of a motor-car but not the headlamps.

Lower Nickel Content Suggested

Mr. Kaberry, seconding the motion, pointed out that a considerable number of articles in daily use in this country were prohibited from having incorporated in them any nickel-containing material. These included agricultural machinery, articles for domestic use, such as carpet sweepers and electrical fittings, various parts of motor vehicles and radio and telecommunication apparatus. He urged a lower level of nickel content.

Miss Hornsby-Smith said another anomaly was that under the Order, as at present drafted, one might not, without a licence, chromium-plate an electric iron, but there could be chromium-plating if a stand was sold with it. There was a new coating called tin-nickel, which was one-third nickel and two-thirds zinc. It eliminated the chrome coating and should result in a substantial saving in the use of nickel. How far was this process advanced?

Mr. M. Stewart, Parliamentary Secretary to the Ministry of Supply, said that there was an increased demand for nickel and it was necessary to restrict its use. The United States had already imposed on itself a substantial restriction. The needs of the export market had been borne in mind when making the Orders.

He said that the Government was negotiating with the O.E.E.C. countries to secure an agreed list of prohibited articles and if there was any reasonable agreement it would remove many of the objections that might be raised to the export of this article. The Government would be prepared to grant licences where they were necessary, for instance, to retain skilled labour in employment, or in some other cases.

Some firms, he said, were likely to be hard hit, but it was not true to suggest that a large number of small firms were facing ruin. The Government could not give a guarantee that any firm which found itself in difficulties could have them removed by doing rearmament work, but if a firm was competent for such work it would have a strong case for being considered. It might prove necessary to introduce a more drastic scheme for the metal. He confessed he did not know why one article on a car could be nickel-plated and not another.

where the Ministry followed the advice of the ade. The motion was withdrawn.

olme Moss Television Station

Mr. Ness Edwards told Col. Stoddart-Scott at the installation of equipment at the Holme oss television station was virtually complete nd final adjustments were being made. The .B.C. hoped to start preliminary test trans- issions this month and to begin a regular rogramme service early in October. The ser- ce area of the station was expected to include ost of Lancashire and the East and West idings of Yorkshire, substantial parts of the orth Riding, Lincolnshire, Nottinghamshire nd Derbyshire, and the whole of the counties f Cheshire and Flint.

adio Interference

In reply to Mr. Langford-Holt Mr. Ness dwards said that the Committee set up under he Wireless Telegraphy Act, 1949, to consider gnition systems had met four times, the last ccasion being on 9th April. The Committee onsidering refrigeration apparatus had met hree times, its last meeting being on 26th ebruary. There had also been eight meetings of sub-committees. Neither committee had yet submitted a report.

Mr. Langford-Holt urged the Postmaster-General to hurry matters up. Mr. Ness Edwards replied that many of the remedies proposed had already been subjected to experimental tests. It was a highly technical matter, but he was sure the Committee recognized the need for haste.

Fuel Co-ordination

Mr. Nabarro asked the Minister of Fuel and Power what progress had been made by the Scientific Division of his Department in formulating a comprehensive and fully co-ordinated national policy for the fuel and power industries.

Mr. Noel-Baker said that the whole field of fuel and power policy was under constant review, but it covered innumerable matters which varied widely in character and required separate consideration in the light of circumstances which sometimes quickly changed. He therefore did not think that it would serve any useful purpose to attempt to make a comprehensive statement of the kind asked for.

Generating Capacity

Mr. Nabarro asked the Minister whether he would state the nature and extent of the shortages of steel and other raw materials during the six months ended 30th June last which caused delay in structural and erection work authorized by his Department at power house sites, and impediments in the expansion of electrical generating capacity; what degree of priority he anticipated that the supply of such materials would enjoy in future; and what steps were being taken to prevent a recurrence of such delays.

Mr. Noel-Baker said that cases of special difficulty would in future be eligible for preferential treatment under the scheme announced by the Chancellor of the Exchequer on 28th June.

The Minister told Mr. Ellis Smith that further effort had been, was being and would be made to speed up the commissioning of generating plant. The commissioning had not so far been delayed by restrictions on capital expenditure; the investment in electricity this year would be considerably higher than it was last year, and in 1952 it would be greater still.

In the course of replying to further questions the Minister said that delivery of power plant was a matter for the manufacturers. The British Electricity Authority had a Progressing Department which worked very closely with the manufacturers and had greatly improved deliveries since the B.E.A. took over.

Reducing the Peak

In reply to further questions by Mr. Nabarro the Minister said he was considering the measures which should be taken to reduce the peak load during the winter months. He hoped that domestic consumers would help, as they had earlier this year.

Mr. Nabarro referred to Lord Citrine's speech at Brighton on 18th June when he said "We are coming nearer to the position where arbitrary action, enforceable by law, may have to be taken by the Government to secure a substantial reduction in consumption." Did the Minister propose legislation to give effect to that serious threat?

Mr. Noel-Baker said that that was another question.

Generation from Atomic Power

In a written reply to questions about developing the use of atomic power for industrial purposes Mr. G. Strauss, Minister of Supply, stated that work on the planning of nuclear reactors for use as power units, and on the development of the necessary facilities for investigating materials for use in such reactors, had continued, and considerable progress had also been made in the technology of the special materials required for reactor construction. Design studies of experimental reactors for marine propulsion and for static use were in progress.

Mr. Strauss said it was too early to make any reliable estimate of the relative cost of generation of electricity by present methods and from atomic power. There was, however, a reasonable prospect that generation from atomic power could be developed on a large scale, and that ultimately the cost would not differ greatly from that of power from conventional sources. The relative cost would vary from place to place, according to the local availability and cost of coal, and to other general economic factors.

Overhead Line Equipment

Increasing Production at a Bridgend Works

THOUGH commencing production only five years ago Line Equipment, Ltd., is now one of the largest manufacturers of air-break switches and fuses for overhead line work. The company specializes extensively in this type of equipment and its products are in use all over the world.

The increased demands for its manufactures have necessitated considerable extensions to the company's original factory at Bridgend, Glamorganshire, and the latest additions just completed add a further 50 per cent to the production area, which now covers about 30,000 sq ft. As far as possible the factory is self-contained. It has its own toolroom, non-ferrous foundry and plating shop together with plant and facilities for the manufacture of supporting steelwork and light supporting structures.

Besides permitting a general expansion of the main production department, the new section of the factory makes possible the establishment of a new plating shop four times the size of the old one, as well as new packing and despatch departments, separate bays for welding and for cementing together the various sections of the

A section of the new porcelain insulator assembly department

Switchgear assembly bay showing 33 kV rocking type isolators *(right)* **with 11 kV units on the floor**

cap and pin type porcelain insulators. In the last mentioned section steam heated ovens have been provided in which the insulators undergo a steam setting and ageing process. The testing laboratory has also recently been rearranged, and additional equipment installed.

The range of equipment manufactured covers switchgear and fusegear for voltages up to 220 kV and current ratings up to 2,000 A. Prototype equipments have been laid down to extend the range to 275 kV. Jig assembly ensures standard products and simplifies installation and maintenance. Rocking, single and double break rotating, or vertical break rotating pedestal isolating switches can be provided and there is a choice of either expulsion or liquid type fuses all of which are made on the premises. The neat system of drop-out expulsion adopted, facilitates fuse replacement from ground level.

A recent innovation is an expanding mechanical contact and this type of contact has been incorporated in a number of 2,000 A 34·5 kV vertical break switches supplied to the Hydro-Electric Power Commission of Ontario which has just placed a further contract for similar units.

Other orders now in hand include 132 kV vertical break switches, etc., for Chile, 33, 66, 110 and 132 kV double break rotating switches for substations in Madras, 132 kV equipment for the Sarda Hydel hydro-electric scheme in India, 33 kV equipments for Ceylon, 66 kV switches for substations in East Africa and expulsion fusegear for South Africa, in addition to large contracts for equipments of all types from the British Electricity Authority and the various Electricity Boards in the United Kingdom and Ireland.

600 A 34·5 kV double break rotating switch on heat test in the laboratory

Irish Power Shortage

From Our Dublin Correspondent

MR. LEMASS, Minister for Industry and Commerce, informed the Dail during a Budget discussion on 28th June that for months past the Irish Electricity Supply Board has been losing £80,000 a month. The Board had, therefore, been urging that the electricity rates should be increased.

Questioned on this subject, the E.S.B., through one of its officials, said the reason for the increased price of electricity was the higher cost of coal and turf which would amount to £1,000,000 during 1951. The Board would use this year approximately 190,000 tons of American coal which cost £8 a ton; 130,000 tons of British coal at £4 10s a ton; 80,000 tons of turf at £2 6s 5d a ton; and a further 100,000 tons of turf at £4 10s a ton.

He further mentioned that 100,000 tons of turf costing the Board £450,000 would be brought to the Portarlington turf station from other parts of the country, particularly the West, as the output from Clonsast bog was limited this year to 80,000 tons. Last year the Board bought British coal at £3 18s a ton and turf at £1 19s 6d a ton. In comparing values it was (he added) necessary to double the price of turf, as the calorific value of turf was approximately half that of coal.

The E.S.B. pursues continuous educative publicity to enable the public to realize the gravity of the situation, and the need for continual and obedient observance of rationing and other regulations. In a new warning emphasis has been laid on the excessive demand for electricity for heating which has reached a point where it is out of any reasonable relation to the total load on the Board's system. During recent months, it is said, the demand for electric heating exceeded the total use of electricity by all industries in the country.

Consumers have been inquiring why rationing should continue. The Board states that the consequence of the refusal of the employees at the Pigeon House generating station to work the customary overtime was a reduction in the output by approximately two million kWh a week. This deficiency had to be made good by the hydro-electric stations using water storage reserves over a period of nine weeks. As a consequence the water storage was at a critically low level. The consumption of electricity was at present about 14 million kWh weekly. If rationing had not been introduced the consumption would be about 16 million kWh. With the depleted water storage the Board could not make good the deficiency.

Another reason for the shortage was that the amount of steam plant available for service at this time of the year was limited by the annual overhaul which must be carried out during the summer months.

A third reason for the recent crisis was that the additional steam plant scheduled to come into commission last year was not yet available. The Allenwood turf generating station which should have been in operation in May, 1950, had not yet been completed. It was expected to be ready by about October next but the manufacturers had just advised the Board that they must now delay completion of the plant for another three months. The Erne scheme should have been in full operation in 1950. As yet only the small station was running. The main one at Cathaleen's Falls could only be brought partly into commission at the end of this year, but fully it was hoped by June, 1952.

At the end of the war (continued the statement) there were three generating stations with a total output of 180,000 kW. Since then three new stations have been completed and additional plant of 80,000 kW brought into commission. Two stations to add another 85,000 kW were approaching completion, and three others to add a further 155,000 kW were under construction.

The capital investment in all this additional plant would be about £17,000,000. There was a similar very large constructional development in transmission and distribution.

The Electricity Supply Board, Dublin, has announced that to cover the high cost of fuel, an increase in charges is to come into force immediately in the form of a surcharge of 0·3d per kWh sold, except in the case of the heat storage rate where the addition is 0·2d. An output of one thousand million kWh of which approximately 35 per cent must be generated from fuel, is anticipated for the current financial year. The estimated fuel bill is £2,700,000, compared with £1,400,000 for about the same output last year. The new charge is estimated to bring about £700,000.

Concrete Farm Buildings

THE Cement and Concrete Association has produced an illustrated leaflet describing the various concrete farm buildings and road construction at last week's Royal Show at Cambridge. All the buildings of the Electrical Development Association " Electricity Farm " were in concrete.

Industrial Research

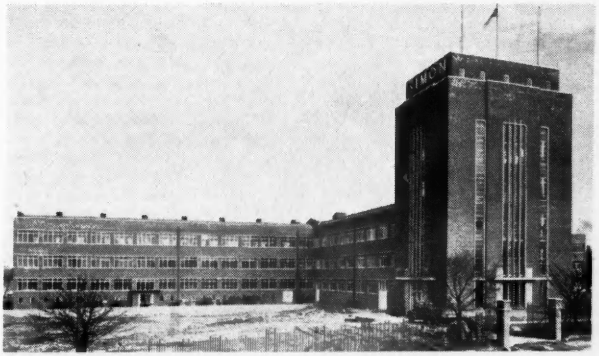
New Laboratories of the Simon Engineering Group

THE new research and development laboratories of the Simon Engineering Group at Cheadle Heath, near Stockport, were officially opened on 3rd July by Sir Henry Tizard, chairman of the Advisory Council on Scientific Policy, as briefly reported in our last issue.

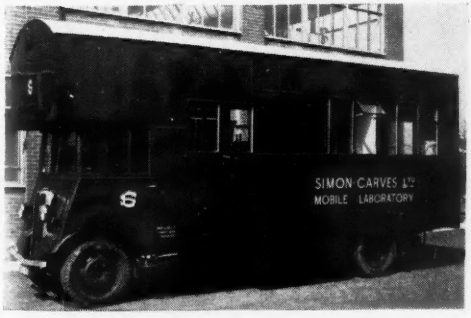
These new buildings have enabled many separate laboratories and experimental plants formerly scattered over the 30 odd acres of Cheadle Heath property to be centralized in a single block of modern buildings with expanded and improved resources and with accommodation for an enlarged and strengthened scientific staff. The work done covers coal cleaning, coal carbonization, treatment of coal by-products, fuel combustion, steam generation, sulphuric acid production, gasworks ancillary processes, electrostatic precipitation, pneumatic and mechanical handling of bulk materials and flour provender milling engineering.

The research department is a central organization serving all the Simon Carves contract departments and its work falls under three main headings; mechanical and chemical testing, research and information. Mechanical and chemical testing is a continuation and expansion of investigations that have taken place over the past 50 years, whereas the organization of research and information services on a central as opposed to departmental basis is a recent development.

Development is dealt with departmentally rather than centrally, the primary purpose of the development engineers being to provide studies for the design of efficient commercial plants with which their respective contracting departments are concerned. The work falls into two categories; the first involves new principles and the study of new processes from the laboratory through pilot plant stages of increasing size; the object of the pilot stages is usually to gain data on the operation of individual



Part of the Simon research and development buildings at Cheadle Heath, near Stockport



This mobile laboratory is equipped for carrying out investigations at coke ovens, coal washers, etc.

units of plant from which successively larger units are designed, while in the later stages the units are integrated into a complete plant. The second category involves no new principle but calls for a study of the operating characteristics of existing full scale plants, the results being applied to the design of future installations or the modification of those already in use.

The erection of pilot plants for the study of new processes is provided for by the development building. The pilot plants are designed so that they may be modified or replaced as occasion demands; certain plants may become permanent when the basic design and operating characteristics are established and they can then supplement the work of the testing laboratories by serving as large scale test units in which clients' materials can be processed.

Site investigations on commercial plants are facilitated by a mobile laboratory fully equipped with test apparatus and instruments.

CONSULTATIVE COUNCIL MEETINGS

AT a meeting of the **East Midlands** Electricity Consultative Council in Nottingham on 27th June members referred to the continued load shedding during the summer months and expressed anxiety about the position next winter. Replying to this point, Mr. L. F. Jeffrey, the B.E.A. East Midlands divisional controller, indicated that at the present time the gap between supply and demand was not being reduced. With the large programme of new generating station construction and the concentration on larger generating sets it was hoped to narrow the gap, but this assumed that there would be no further cuts in capital expenditure and no alteration in the allocation of material and labour priorities. After discussing this matter the Council unanimously agreed to forward a resolution to the Area Board "viewing with deep concern" the prospects of severe load shedding during the coming winter and urging the Board to press for the speeding up of the plant programme and the removal of capital restrictions which might cause delay.

Various representations regarding the effect of the new standard domestic tariff were discussed and were referred to the appropriate local committees for detailed examination. Previously the Council had informed the Board that in its view the new tariff appeared to be fair and reasonable, but the Council reserved the right to make representations should any anomalies be brought to its notice.

Eastern.—Increases in tariffs which the Eastern Electricity Board proposes to bring into force after 31st August were referred to at last Friday's meeting of the Electricity Consultative Council for the Area. Alderman W. J. Bennett (chairman) said the Council took the view that the proposal to increase the minimum fixed charge for domestic consumers from £2 8s to £3 was not justified at this stage. It was of the opinion that the poorer sections of the community were being called upon to meet continual rises in tariffs—this was the fourth since vesting day. At the same time the Council was not satisfied that it had a sufficiently strong case to go to the B.E.A. or the Minister as the information was not complete. The Board had referred to the sum of £3 as being "more appropriate to the cost of providing these supplies under present-day conditions" and the Council was asking for the figures on which this statement was made.

Remarking that in the period since vesting day the number of farms served in the Area had increased by no less than 40 per cent and the number of consumers by 30 per cent, the chairman said that the increase in demand was greater than the increase in plant, creating a very serious position. Referring to a suggestion mentioned by another member that broadcasting hours should be reduced to lessen load shedding, he said that the 8 a.m. news was regarded as the most important listening period. There was a distinct "bump" in the load curve between 8 and 8.30 a.m.; if 12½ million radio sets were all switched on they would account for something like 1,000 MW. There was hesitancy, however, to add further to the restrictions on the public.

Merseyside and North Wales.—The Consultative Council, at its meeting at Chester last week, decided to support the Southport Corporation's application for sanction to a loan of £4,500 to enable electricity to be installed in 186 houses on the Essex Road estate. Alderman W. H. Bellis, of Southport, said that the Area Board was prepared to undertake the supply to the houses, which were built 25 years ago. The difficulty had arisen because the Ministry of Local Government and Planning had taken the view that, owing to the country's economic stress, the scheme should be postponed for eighteen months and reconsidered then. Alderman Bellis remarked that the greater the development in urban areas the more easily could rural areas be tackled.

Commerce and Industry

National Fuel Policy

Customs Tariff Reductions

AT a conference of the National Union of Mineworkers last week the Minister of Fuel and Power (Mr. P. Noel-Baker) announced his intention of appointing a committee to consider the co-ordination of the fuel services. This committee would consider whether the various forms of fuel were being used for their proper purposes, whether electricity should be used for domestic, office and factory heating and whether gas should be used for public lighting. It would also ascertain the true costs of different fuels as used for various purposes.

Mr. Noel-Baker said that about 80 per cent of fuel was wasted; if the waste could be cut to 72 per cent there would be an annual saving of 60 million tons of coal. Among the causes of waste he mentioned old power stations.

Irish Duty on Water Heaters

The Senate of the Irish Republic recently passed the Imposition of Duties (Confirmation of Order) (No. 2) Bill which is designed to extend import duties to cover a wider range of electric water heaters of types made in Ireland. Mr. MacEntee, Minister for Finance, was asked if one firm was being given a monopoly of the manufacture of these heaters. He said that at present only one firm was concerned. Despite the rise in the cost of materials during the past year this firm had reduced its prices which now compared very favourably with prices of imported water heaters.

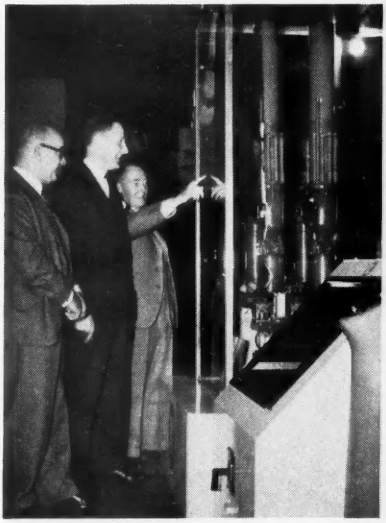
E.C.C. London Showroom

On 5th July the new London office and showroom of the Electric Construction Co., Ltd., was officially inaugurated at 57, Buckingham Gate, S.W.1. Although the company has occupied six previous offices in London this is the first time that it has obtained exclusive use of the premises and the added advantage of a showroom. Here there is a display of typical examples of the company's motors, together with panel mounting instruments, switchgear, mercury arc rectifiers and the well-known "Varispeed" variable speed motor drive, supplemented by photographs of transformer installations and a display of technical publications dealing with this comprehensive range of equipment in detail.

In proposing the toast "Our Guests" at a luncheon which was held to mark the occasion, Mr. W. M. F. Furniss, assistant managing director, gave a brief outline of the company's history since it was first formed in 1882, and mentioned some of the more important projects upon which it has been engaged both in peace and in war. Lord Verulam, chairman of Enfield Cables, Ltd., responded.

Bristol Electrical Exhibition

In connection with the Bristol "Festival of Britain" celebrations the South Western Electricity Board (Central Bristol District) has staged, at its Colston Avenue showroom, an exhibition entitled "Electricity in the Service of the Community." Aiming at explaining in simple and effective terms the vital part electricity plays in modern life, it includes sections



Inspecting an English Electric demonstration model 6·6 kV air blast switch at the "Electricity in the Service of the Community" Exhibition at Bristol. *Left to right:* **Mr. G. W. Richards, deputy manager, Bristol Sub-Area, South Western Electricity Board, Mr. S. F. Steward, chairman, South Western Board, and Mr. G. Robinson, Bristol manager, English Electric Co., Ltd.**

covering generation, distribution, industry, agriculture, catering, domestic uses, communications, electronics, entertainment and health. Items of special interest are demonstrations of marine radar and radio, direct communications with ships at sea, B.B.C. outside broadcasting equipment, stage colour lighting, a new type of radiography equipment, an electronic counter, washing machine demonstrations and a comprehensive display of farm equipment.

Purchase Tax by Instalments

Until recently consumers buying domestic appliances from the North Eastern Electricity Board had to pay the whole of the purchase tax at the outset, even if the appliances were being supplied on hire-purchase terms. Now, says the *Newcastle Chronicle*, the Board has arranged for the payment of the tax by instalments. An official of the Board is quoted as saying that although it was recognized that the more appliances sold the greater the inconvenience during electricity cuts the Board felt justified in getting a share of the business so long as private firms were selling appliances.

Berry's Manchester Branch

The decoration and fitting out of the five separate showrooms has now been completed at 66, Mosley Street, Manchester, 2, where the Manchester branch of Berry's Electric, Ltd., was moved last year. The large space available makes it possible to group the fire and lighting fittings in their correct settings—Tudor, Queen Anne, Regency and 20th Century.

Catering in Aircraft

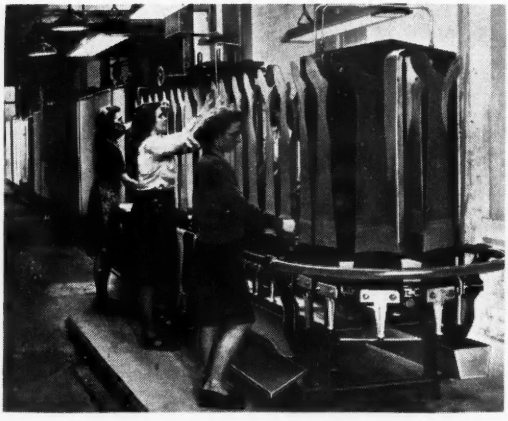
In the K.L.M. "Skymaster" aircraft which flew the Austin A.40 sports car on the airborne

G.E.C. heated food and liquid containers in the galley of the aircraft

stages of its recent round-the-world trip, a hot meal service was provided by two G.E.C. heated food and liquid containers of the same type as those now being adopted as standard by British European Airways in all their passenger aircraft. Food and liquids taken on board are kept hot by four 28 V, 50 W hairpin type elements in each glass wool insulated container. Each container holds 12 plates of food or 1½ gall of liquid.

Nylon Stocking Finishing

By the use of the Klinger/Schuster infra-red finishing machine forty to forty-five dozen pairs of stockings can be processed per hour. The superheated chamber of the apparatus plasticizes the nylon to enable the stockings to be set in their final crease-free shape. Standard "Metrovick" tubular sheathed infra-red elements are employed in suitable reflectors with a total loading of 104 kW.



"Metrovick" infra-red apparatus for nylon stocking finishing

"Cold Cookery"

A revised version of "Cold Cookery," published by the British Electrical Development Association (price 2s 6d) contains new information and illustrations for getting the best service from the refrigerator. The very

full recipe sections are all in line with present conditions of catering and space has been found for the inclusion of several useful cream-making hints and a table of weights and measures using the post-war British Standards Institution measuring cup.

"Torquay" Tariff Reductions

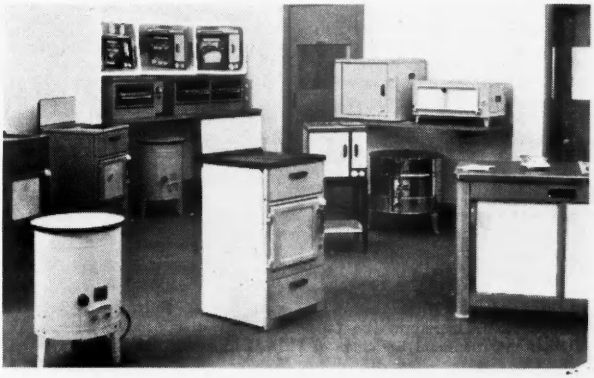
As a consequence of the agreement on tariffs made at the recent Torquay conference the Board of Trade has issued a list showing the goods upon which import duties are to be reduced as from 1st September next. They include arc-lamp carbons (not copper coated or exceeding 14 mm in diameter), amorphous carbon electrodes (not including primary battery or arc-lamp carbons), porcelain insulators weighing more than 2 lb, permanent magnets, ignition magnetos, perforated separators for accumulators (not for motor vehicles), electric motor and generator casings, carbon brushes fitted with metal terminals or connectors, dynamo lighting sets for cycles (not motor cycles), electric lamps for use on cycles and cases thereof.

National Union of Manufacturers

We have received from the National Union of Manufacturers, 6, Holborn Viaduct, London, E.C.1, a copy of its 1950–51 list of members of which there are 5,200 in all branches of British industry. In the first section the names are arranged alphabetically with addresses, telephone numbers and brief particulars of products. The latter half is a classified directory in which the members are listed under their manufactures. The price of the publication to non-members is £1.

Jackson Liverpool Branch

The Jackson Electric Stove Co., Ltd., has recently opened a new branch office at 60A, Bold Street, Liverpool, 1 (telephone: Royal 6910), under the direction of the company's branch manager, Mr. C. L. Brown. This new office serves both the North Western and the Merseyside and North Wales Electricity Boards. The offices also contain a large showroom and a kitchen demonstration platform.



The new showroom of the Jackson Electric Stove Co., Ltd., at Liverpool

British Industries Fair

Intending exhibitors at next year's British Industries Fair, which is to be held from 5th to 16th May, should apply without delay to the Birmingham Chamber of Commerce, 95, New Street, Birmingham (for the Engineering and Hardware Section at Castle Bromwich), or to the Commercial Relations and Exports Department, Board of Trade, Lacon House, Theobalds Road, London, W.C.1 (for the Olympia and Earls Court Sections, London).

New Electricity Showrooms for Dudley

The Midlands Electricity Board has bought, for £30,000, a property in Castle Street, Dudley, for use as a showroom and offices. The existing showrooms in Hall Street, will be closed as showrooms when the new premises are opened.

Metrovick Strikers Resume Work

About 100 men who had been on strike at the Stockton-on-Tees works of Metropolitan-Vickers Electrical Co., Ltd., on the grounds that two men from the Transport and General Workers' Union had been given work normally carried out by members of the Amalgamated Engineering Union, have now returned to work. The two men directly concerned have left the works of their own accord. The works management stated that it was not prepared to support any plan for a closed shop of A.E.U. members.

Vacuum Cleaner Jubilee

At the Savoy Hotel, London, on Wednesday last week a cocktail party was given by the British Vacuum Cleaner and Engineering Co., Ltd., to celebrate the fiftieth anniversary of the invention of the vacuum cleaner. The guests were received by the inventor, Mr. H. Cecil Booth, F.C.G.I., M.Inst.C.E., who is chairman of the company. Many well-known electrical men attended the party including Sir Charles Colston, chairman of Hoover, Ltd. The idea of the vacuum cleaner was patented by Mr. Booth

in 1901 and early in the following year he and some friends formed the Vacuum Cleaner Co., Ltd., this apparently being the first appearance of the term "vacuum cleaner" in print. The original company operated with vans and long hoses were taken from these into the premises of customers.

Annual Holidays

Erskine, Heap & Co., Ltd., are closing their works from 27th July to 7th August.

The Luton works of the Jackson Electric Stove Co., Ltd., will be closed for annual holidays from 27th July to 7th August.

The works of the Wellman Smith Owen Engineering Corporation, Ltd., will be closed from 27th July until 7th August.

The Eureka Conduits and Fittings Co., Walsall, is closing its works from 27th July until 7th August.

The works of Gillott Electro-Steam Cookers, Ltd., Chalford, Glos, will be closed from 28th July to 7th August inclusive. A skeleton staff will deal with urgent correspondence.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £124 0s 0d
COPPER, H.C. Electro	ton £234 0s 0d
Fire Refined 99·7 per cent ..	ton £233 0s 0d
Fire Refined 99·2 per cent ..	ton £232 10s 0d
LEAD, English	ton £161 0s 0d
MERCURY	flask £73 10s 0d
TIN	ton £915 0s 0d
ZINC, G.O.B. Foreign	ton £160 0s 0d
Electrolytic	ton £164 0s 0d
BRASS Tubes	lb 2s 0¼d
Sheet	lb 2s 3⅜d
Wire	lb 2s 6½d
COPPER Tubes	lb 2s 2⅝d
Sheet	ton £284 10s 0d
H.C. wire and strip	ton £261 15s 0d
PHOSPHOR BRONZE	
Wire	lb 3s 7¼d
RUBBER, No. 1 R.S.S. spot ..	lb 45d–45½d

E.D.A. Films Abroad

One of the latest additions to the Electrical Development Association's series of educational films, "Electricity and Light," part of which is in colour, has been selected for the next Venice Film Festival. This film, together with "Magnetism" and "Electrical Terms" has also been chosen for the Edinburgh International Festival. From the outset, the library of the film section of the Festival of Britain at the Science Museum, Kensington, has included the E.D.A. educational films "Electricity and Light" and "Putting Free Electrons to Work." A third film, "Magnetism," has now been selected for inclusion in the programmes.

Other international bookings of E.D.A. films are:—International Scientific Film Association Congress at The Hague—"Magnetism" and "Electricity and Light"; Berlin Film Festival—"Electro-Chemistry" and "Fifty Acres"; and Cannes Film Festival—"Magnetism."

Trade Announcements

The head office, works and stores of **Oswald Jones (Wrexham), Ltd.,** are now at Maesgwyn Works, 18, Maesgwyn Road, Wrexham (telephone: Wrexham 2900). The retail showroom, radio and television service departments remain at 4, Lambpit Street, Wrexham.

A branch office has been opened by **Gent & Co., Ltd.,** at Winchester House, Victoria Square, Birmingham, where Mr. J. P. Devlin will be in charge. The telephone number is Midland 6443.

The fork truck division of **Electro-Hydraulics, Ltd.,** formerly known as "Conveyancer Fork Truck Co." has been incorporated as a separate private company, Conveyancer Fork Trucks, Ltd., registered office, Liverpool Road, Warrington.

The Skefko Ball Bearing Co., Ltd., has opened a new branch office at 141, Dale Street, Kingsway, Liverpool, 2 (telephone: Central 7226). The new branch will be in the charge of Mr. E. Buckley, under the control of the district manager, Mr. N. A. Whyte.

Standard Telephones & Cables, Ltd., have appointed A. W. Gordon, Ltd., 11, Gloucester Street, Belfast, as their sole selling agents in Northern Ireland for cables, selenium rectifiers, private automatic telephone exchanges, intercommunicating telephones, fire alarms, p.f. correction capacitors, radio frequency heating equipment, etc.

Catalogues and Lists

James Beresford & Son, Ltd., Marston Green, Birmingham, 33.—Explanatory brochure on pumps and pumping.

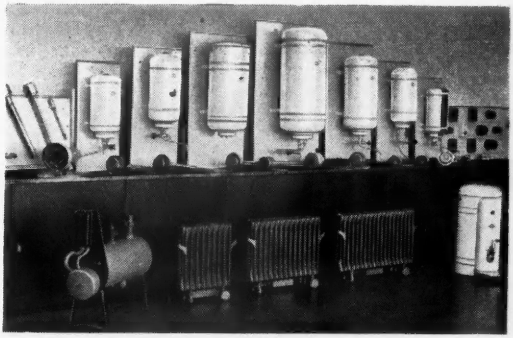
Chloride Batteries, Ltd., Exide Works, Clifton Junction, Nr. Manchester.—Technical brochure on "Exide Ironclad" batteries for traction purposes.

Magna Jobson Research Centre, 47, Barnhorn Road, Little Common, Bexhill, Sussex.—Technical brochure on the stroboscope with particular reference to the "Ashdown Rotoscope."

H. K. Lewis & Co., Ltd., 136, Gower Street, London, W.C.1.—Priced catalogue of books on mathematics, physics, astronomy and meteorology and another on electrical engineering, radio and electronics.

English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2.—Technical folder on the Type OKD1B frame mounted 22 and 33 kV outdoor oil circuit breaker.

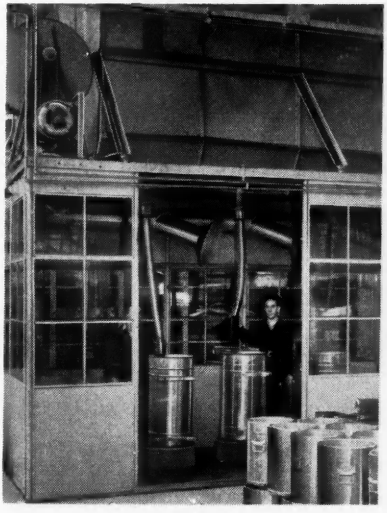
Water Heater Production



Large New Factory in Operation at Newport

IN view of the existence of the heavy purchase tax on its products, one might expect to find business in the water heating industry in a somewhat depressed state. If it is permissible to take the experiences of Santon, Ltd., as typical, this is far from the case. Owing to the growing appreciation of the advantages of electric water heating, coupled with the shortage of solid fuel, the demand for apparatus has never been greater. Not only has the company now in full production at Newport, Mon, a new factory three times as big as its old premises, but it has had to retain in service this latter building and also another branch works, which it had planned to shut down. The number of employees has been increased from 500 to 800.

Plant for inserting the cork lagging into thermal storage heaters



The new Somerton Works, which probably produces the largest number of electric water heating units in Europe, stands on a 25-acre site amidst pleasant rural surroundings within sight of the old Somerton Works (now renamed the County Works). With its surrounding lawns, trees, shrubs, etc., it covers about 10 acres, the remaining 15 acres being available for extensions and sports grounds. The factory itself has a floor area of 90,000 sq ft of which 50,000 sq ft is occupied by one large single-storey production shop with no partitions.

The unloading bay for raw materials is situated at the southern end of the factory and is designed so that road vehicles may drive right into the factory for unloading by means of electric cranes and "Conveyancer" fork lift trucks. From the unloading bay the materials pass via the incoming inspection department into the main stores, which extend across the full width of the factory and are constructed of steel binning arranged in two storeys, with a capacity of 240,000 cu ft.

The works production and progress offices are situated on a "quarter deck" adjacent to the stores with a clear view of the whole of the factory. Extending down the length of the centre of the factory is a fully equipped toolroom, machine shop and

press shop. A very large proportion of the components used in Santon equipment is produced in this area. The toolroom not only produces press tools, jigs, gauges and machining fixtures for production, but also much of the specialized machinery required.

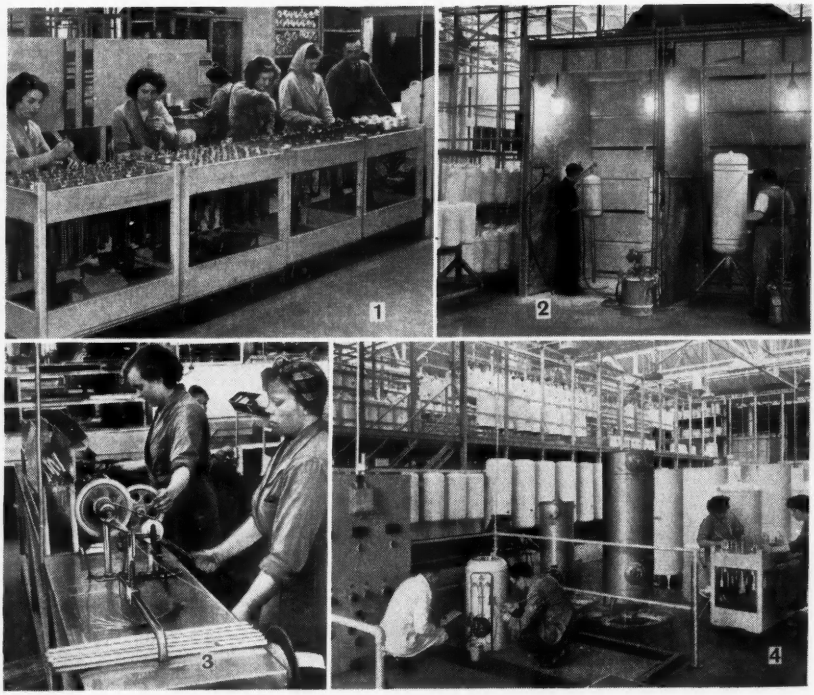
To the right of the machine shop is a thermal storage heater manufacturing area so arranged that all work flows from the raw material stores to the finished product stores and despatch department at the other end of the building. The smaller heaters are built on a conveyor line, batch production being used for the larger models.

A special feature of this department is a silo for handling the granulated cork used as a lagging material. The cork is pumped into this silo like water and then delivered through various nozzles direct into the heaters. Another feature of this department is a grooving machine made in the factory for seaming large capacity outer casings.

The stove enamel department, which occupies an area of 3,000 sq ft, is constructed almost entirely of glass. It has its own air heating and conditioning plant which introduces filtered heated air into the department at a rate in excess of that at which the exhaust fans extract the spray dust from the booths. This results in the department operating at a pressure above that of the remainder of the factory, so that it is maintained entirely free from dust.

The turntables of the spray booths, designed and produced by the company itself, are raised and lowered by compressed air to speed up spraying. All metal casings are subjected to special pre-treatment designed to prevent oxidization and to provide a first class key for the enamel which is stoved after spraying. All the

(1) Many thousands of immersion heaters are now being made in the factory each month. (2) Paint spraying 1½, 3 and 12 gal thermal storage heaters. (3) Winding "R" "sword and sheath" type elements. (4) Water boiler test section. One wiring trolley for thermal storage heaters is seen on the right with the bulk store in the background



more popular sizes of thermal storage heater have outer casings constructed entirely from pure aluminium.

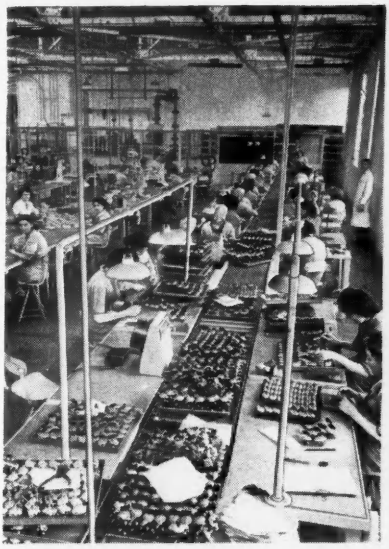
After final water and electrical tests, the heaters pass either to the bulk store or direct to the despatch department. Close to the final assembly area is the apparatus plate assembly department, in which there is a hydraulic press which assembles the components in the apparatus plates in such a manner that watertight joints are obtained even before tinning.

On the other side of the central machine shop is one of the immersion heater assembly departments producing the "Q" type element which is a non-withdrawable sheath mineral insulated unit used principally in immersion heaters; this has special applications for high temperature work. Nearby are other heating element winding departments which produce open wound refractory insulated heating elements of large diameter used principally in thermal storage heaters; and the "R" type "sword and sheath" withdrawable element which contains a concentric spiral return wire insulated with refractory tubes and powder. Altogether many thousands of immersion heaters of all types are now being made each month.

Finally, on the extreme left of the factory, viewed from the production office, is the main rotary switchgear assembly shop where upwards of 40,000 switches of all types are produced a month. This contains its own mechanized conveyor which runs from the collection stores at one end to the despatch section at the other. Raw material is fed on to the conveyor from the stores and the switches are assembled, tested and packed on line. All these production shops run in a straight line from the incoming stores to the despatch area. Close to the stores is the electroplating department which is separated from the rest of the factory by brick partitions.

All structural steel work is cream, machine tools are eau-de-nil with yellow handles, electrical controls tangerine, bins and partitions birch-grey and assembly benches blush stone. A thermostatically controlled air conditioning system introduces warm air in the winter and cool air in the summer.

The old factory is at the moment being laid out for the manufacture of "R" type immersion heaters, large capacity rotary



One of the rotary switchgear assembly lines, utilizing a mechanized conveyor

switchgear, electrically heated liquid filled central heating radiators and much of the heavy duty and industrial equipment in rapidly increasing demand. Arrangements are also being made for the manufacture of the company's latest product, an electrically heated shower bath (see page 103).

A stage in the assembly of rotary switches, which are so constructed as to make it possible to provide any desired switch sequence

What is Electricity?

The Improbability of Assumed Realities

By KENNETH ORCHARD, A.M.I.E.E.

ONE of the most surprising features of our undoubted progress over the past fifty years in physics and electrical technology is the lack of progress in the construction of a generally accepted philosophical system.

By the end of the last century, materialistic scientists were expecting to discover the fundamental nature of matter and energy, which appeared to be " just around the corner." And now, with all our technological advances, the fundamentals seem still farther from us, so that some people think they are quite beyond our ken.

It was in the fifth century B.C. that Democritus expounded the atomist theory that all matter was formed of particles similar in substance, but different in size and shape, and that all events followed a cause. It is true that the Greeks made a habit of explaining the Universe and, between them, put forward so many and varied theories that one of them was almost certain to be near the truth. Certainly Democritus seems to have put forward a half truth.

Atomic Theory

The atomic theory received its first important scientific impetus when John Dalton, in the nineteenth century, saw that combining weights in chemical compounds might indicate the relative weights of atoms.

Over the past fifty years it has been common practice to explain electricity by postulating an atom of matter as consisting of a central nucleus containing protons and neutrons with, moving orbitally at high speed round it, a number of electrons. The nucleus has a positive electrical charge, which is neutralized in the normal atom by the number of orbital electrons with negative charge. Hydrogen, for instance, has a single positive charge in its nucleus, which is neutralized by a single orbital electron. If an orbital electron is removed from the atom the latter becomes, as a whole, positively charged and the movement of the electron from the atom constitutes an electric current. When its orbital electrons are removed the nucleus retains its chemical nature, but becomes ionized positively.

The whole theory can be complicated by consideration of isotopes, neutrons and so on, but fundamentally that is the usually accepted theory; as an explanation of electricity it will remain unsatisfactory until the electron can be defined. One so easily forms a concept of little billiard balls floating about in mid-air, possibly because the orrery was so popular in the last century for picturing the motion of planets.

Behaviour of Electron

The electron actually appears to have a disconcerting habit of behaving like a particle on some occasions and then, to confuse us, insisting on behaving as if it had no tangible existence at all, seeming to consist entirely of waves. However, an electron does possess mass and motion, and so energy.

When the laws of conservation of matter and energy were believed true, matter remained matter and energy was forever energy in one form or another. Thus the " particle " picture of an electron was then reasonably satisfying, especially to the materialist school of thought; but now we know matter may be converted into energy (the proof lies in Hiroshima) and mass varies with relative speed. It seems impossible to picture an electron at all, so it appears that the electric current consists of a flow of electrons while an electron is to be represented by waves. When an atom with excess electrons (negatively charged) is in proximity to an atom deficient in electrons (positively charged) an electric field is said to exist between them. When an electron moves from an atom it represents an electric current and a magnetic field is said to surround it. When conditions are such that simultaneously an electric field exists at right angles to a

magnetic field, energy is being transmitted at right angles to both and this is the condition obtaining in electromagnetic waves when radio, heat, light, X-rays, etc., are radiated.

Properties of Magnetic Waves

When Maxwell first derived equations to show that electromagnetic waves possessed the same properties as light it was thought necessary to introduce a fictitious ether in order to permit one to assume waves "of something," but there has never been any experimental evidence to justify the assumption that there is an ether. A vacuum has a dielectric constant and a magnetic permeability, which is all that is necessary for passage of an electromagnetic wave, without the further complication of imagining the vacuum to contain an intangible ether.

The electromagnetic wave itself is found not to be continuous, but to travel in minute gushes, or *quanta*, in much the same way as the light beam on a cinema screen is interrupted, although an electromagnetic wave usually consists of such a colossal number of *quanta* that an appearance of continuity is formed.

The concept of electromagnetic waves, while serving us well in providing practical results, through our ability to manipulate the mathematical abstraction it produces, may nevertheless be misleading. When an oscillograph pictures a waveform, it is difficult to realize that the picture is but one which we have produced ourselves; a mathematical interpretation of some physical phenomena which is only faintly related to the picture. If the waveform is complex and it is analysed into sine waves, the mathematical picture is simplified, but the reality becomes even more remote.

We have become so familiar with the results achieved from the study of electromagnetic fields, that these fields have assumed in our minds a reality which they probably do not possess; they should be regarded as purely conceptual, and the time may come when the concept of electric and magnetic fields will become as unnecessary as the "force of gravity" becomes when applying the theory of relativity.

The space through which the electromagnetic wave travels is not what it seems; for we have developed the habit of regarding time as something separable from space, whereas a space cannot be without time, and time without space is equally impossible. So time must be regarded as the fourth dimension of space. The theory of relativity demands that we regard space as a space time continuum, and all observations of events not as objective observation, but as the observation of events in relation to the observer.

Science, while aiming to reveal absolute truth, recognizes that this may never be attainable by scientific methods and consequently accepts, tentatively, the theory which best fits known facts. Any scientific theory may be modified as knowledge grows, generally with a view to greater accuracy in predicting events. For example, the "wave picture" fits more of the observed phenomena than the "particle picture" and so may be accepted for the present.

In seeking the truth about electricity we naturally look for the simplest explanation. But there is no evidence that Nature is simple at all; there does not appear to be any logical reason why a simple theory should be more correct than an abstruse one, if they both fit known facts. Ptolemy said that the sun moved round the earth; Copernicus said the earth moved round the sun; it now appears to be a matter of indifference to us, since their motions are relative to each other. It is perhaps simpler to imagine an electromagnetic wave in an ether than the same wave in nothing, but it is not necessarily more true.

Laws of Probability

The laws of Nature are now sometimes regarded as laws of probability. The statistician can say with fair accuracy how many men of a large group will live to the age of seventy, but he could not say which men of the group they would be. Half of a piece of radium will disintegrate in sixteen hundred years, but the life of a particular radium atom is unforeseeable. An atom of radioactive matter apparently disintegrates spontaneously and in so doing upsets our hitherto scientific principle of cause and effect. It may well be that there is a cause, of which we are at present ignorant. Very little seems to be known of the cosmic radiations thought to be due to the annihilation of matter in stellar space, and it may be that some undiscovered radiation of this nature impinging on a

radioactive nucleus causes its transmutation.

One of our difficulties in trying to probe the secret of the electron is that our finest probe is the electron itself; possibly cosmic radiations will provide a new and finer tool. The laws governing immense groups of electrons form our electrical technology, but what laws govern single electrons? We shall probably never know, as our five senses are too coarse-meshed a net to catch that fish. Mach pointed out that science merely creates a model of what our senses tell us about Nature.

An electron might be described as a mathematical point possessing mass associated with a wave. This wave is not regarded as having any physical interpretation and does not carry energy, but is of the nature of a wave of probability, places where the wave is intense being the most likely places for the electron to appear. Matter and energy are fundamentally the same, electricity being one aspect of energy. But our present knowledge of the atomic nucleus and the electron is sadly lacking, and one cannot but compare the mystery of microcosmos with the mystery of macrocosmos.

To the plain man it seems unfortunate that scientific progress in the past fifty years has been away from the objective, mechanistic, picturable universe of the last century and towards a subjective world of intangible waves of probability, a mathematician's paradise where only formulæ are "real" and their symbols have no physical meaning.

B.E.A. Contracts

DURING the past month the British Electricity Authority has placed contracts for equipment for power stations, transforming stations and transmission lines amounting in the aggregate to £8,496,648. The principal contracts, including the erection of a 275 kV double circuit line between Scotland and Yorkshire and several bulk orders for transformers, are as follows:—

Acton Lane "B" power station, London: Framework for turbine house, switch house, workshop and stores (Sir Robert McAlpine & Sons). Brunswick Wharf station, London: Circulating water pipework (Aiton & Co.) and ash- and dust-handling plant (Babcock & Wilcox). Hackney station: Structural steelwork (Horseley Bridge & Thos. Piggott). Willesden station: 33 kV switchgear (A. Reyrolle & Co.). Rye House station, Herts: Cables and accessories (British Insulated Callender's Cables). Meaford "B" station, nr. Stone, Staffs: Coal handling plant (Babcock & Wilcox) and 132 kV 2,500 MVA switchgear (General Electric Co.).

Uskmouth station, Newport: Foundations, tunnels and sundry works for coal-handling plant (John Morgan (Builders), Ltd.). Connah's Quay station, Chester: Generator and station transformers (C. A. Parsons & Co.). Northampton station: Superstructure (Wm. Moss & Sons). Doncaster station: Superstructures for main and ancillary buildings (J. Gerrard & Sons). Chadderton station, Oldham: Superstructure to ancillary buildings (M. J. Gleeson (Contractors), Ltd.) and railway sidings (Thos. W. Ward). Keadby station, Scunthorpe: Cables, connections and lighting installation (W. T. Henley's Telegraph Works Co.). Stella South station, Blaydon-on-Tyne: Site clearance, access roads, construction of sidings and offices, diversion of stream and sewers and other preliminary works (Sir Robert McAlpine & Sons (Newcastle-on-Tyne), Ltd.).

Roosecote station, Barrow: Coal-handling plant (Robert Dempster & Sons). Huncoat station, Accrington: Drainage, roads and paths (J. Jarvis & Sons). Fleetwood station: Condensing and feed heating plants for two 30 MW turbo-generators (Vickers-Armstrong). Stourport station: 132 kV 2,500 MVA switchgear (General Electric Co.). Hawarden–Bangor, North Wales: 132 kV overhead line (British Insulated Callender's Construction Co.). Bonnybridge–Devonside, South East Scotland: 132 kV overhead line (J. L. Eve Construction Co.). Clydes Mill (Glasgow)–West Melton (Yorks): 275 kV double-circuit overhead line—Sections Clydes Mill to Stella, Blaydon-on-Tyne and Thirsk, Yorks, to West Melton (Balfour, Beatty & Co.) and Section Stella to Thirsk (British Insulated Callender's Construction Co.).

Bulk orders for 275/132 kV 120 MVA auto-transformers as follows:—British Electric Transformer Co., four (Elstree); British Thomson-Houston Co., three (Staythorpe, Notts, one and West Melton, Yorks, two); English Electric Co., two (Drakelow, Burton-on-Trent); Ferranti, Ltd., two (Ferrybridge, Yorks): Metropolitan-Vickers Electrical Co., four (Carrington, Manchester): and C. A. Parsons & Co., two (Stella, Blaydon-on-Tyne).

Telephone Wire Standards

OVERHEAD line materials, non-ferrous, for telegraph and telephone purposes are the subject of B.S.174-181, which have been amended and corrected in a few minor respects in accordance with changes that have taken place since 1938. The only major alteration is the omission of the specification for bronze wire, for which there is little demand now. Copies of these eight combined specifications are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1, price 4s post free.

ELECTRICITY SUPPLY

Load Position in North-East

Lanarkshire Rural Development

A STATEMENT issued by the Northern Regional Board for Industry, Newcastle-on-Tyne, on recent electricity cuts in the area said that, according to the North Eastern Electricity Board, a breakdown of electrical plant at Dunston and trouble with generating plant at Glasgow, Carlisle and Hull had restricted the import of power from the grid. In the North-East, the load was mainly industrial and because of this the domestic and commercial load was not sufficient to provide a major part of the relief required. The Northern Regional Board for Industry has urged that firms not normally making electrical plant should be asked to help in supplying this equipment for the electricity supply industry. This extra plant could if necessary be housed in temporary buildings.

"Telephone Fan" Warning System

Industrialists in the Stockport and Macclesfield areas are reported to be considering a "telephone fan" system for passing on warnings of power cuts next winter. One or more key factories in each group would be given a warning of a proposed cut five minutes in advance and they would pass it on to three or four others, which would in turn send on the message.

Rural Electrification in S.W. Scotland

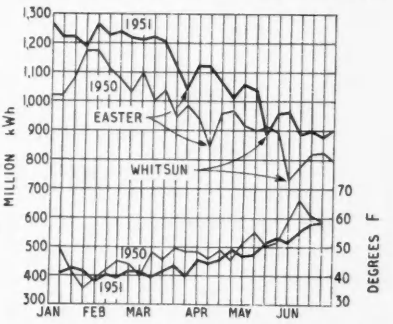
On 3rd July a "switch-on" ceremony in the isolated village of Chapelton, Lanarkshire, marked the completion of the first rural development scheme in the South West Scotland Electricity Board's Lanarkshire Sub-Area. This scheme is part of a £3 million rural development programme which will be the means of taking electricity to those hamlets and farms still without supply. In the Board's area, 55 per cent of the farms now have a public supply of electricity. There are, however, nearly 5,000 farms and some 7,500 cottages and other rural premises without electricity and these are being dealt with under the new development programme which, it is hoped, will be completed by 1957.

Miners Press for Electricity

A deputation from Rossington, a mining village near Doncaster, recently journeyed to London for an interview with Lord Citrine, chairman of the British Electricity Authority, regarding delay in the installation of electricity in miners' houses in the village. After the meeting, which was also attended by Mr. W. M. Lapper, chairman of the Yorkshire Electricity Board, Alderman H. Hughes (Rossington Parish Council) said they were very hopeful of the electrification of Rossington homes by gradual stages. The 9,500 people wanted electricity instead of gas and most of the houses were already wired. Earlier last month it was reported that the miners had threatened to tender strike notice in protest at the delay but this was called off when it was decided to send the delegation.

Electricity and Temperature

According to the weekly statistical statement issued by the Ministry of Fuel and Power 28,493·8 million kWh was sent out for public supply from solid fuel fired stations during the first six months of the year. This compares with 25,085·3 million kWh in the first half of 1950, representing an increase of 13·6 per cent. In the accompanying graph the weekly output figures are compared with the average weekly temperatures.



Electricity output and weekly average temperature curves for the first six months of 1950 and 1951

Use of Weymouth Harbour

Recently Weymouth Town Council adopted a resolution to open negotiations with the gas and electricity authorities to bring coal ships into the harbour, but after hearing a report from the Harbour Committee the Council has now decided to take no further action for the

present. The Committee pointed out that to enable vessels to be brought above the Town Bridge it would be necessary to undertake a major dredging scheme; in 1948 the lowest tender received for this work was £25,562. The British Electricity Authority had declined to participate in any such scheme.

Opposition to Sunderland Bill

The British Electricity Authority and the North Eastern Electricity Board are opposing a Bill promoted by the Sunderland Corporation, one of the clauses of which would give the Corporation power to break up streets to install a district heating scheme. The objections of both the B.E.A. and the North Eastern Electricity Board centre round the fact that the Bill gives them no protection against interference from the steam or hot water pipes near electric lines and apparatus, nor does it lay down a limit for the number of pipes. Similar objections are being put forward by the water and gas authorities. The Bill recently went before a House of Commons Select Committee.

Irish Wind Power Experiments

The Electricity Supply Board, Dublin, has been making a series of wind velocity tests on Co. Donegal hilltops during the last nine months. The results, just made known, have proved so satisfactory that the Board intends to extend the experiments to other parts of the West Coast. This first serious step in the investigation of the use of wind power as a means of generating electricity was taken in September, 1950, since when six anemometer stations have been making uninterrupted records of the wind velocities. During the coming autumn new stations will be erected at Connemara, in Galway, in Co. Clare and in Co. Kerry.

Plant for Pakistan

Because it is thought that further discussions in the manufacturing countries might be advantageous, a representative of the Pakistan Department of Supply and Development is visiting Europe and the United Kingdom, and may later proceed to the United States, for the purpose of placing orders for thermal generating plant. Orders may be placed for six or seven units ranging from 10,000 to 30,000 kW.

Council House Installations

Greenwich Metropolitan Borough Council reports that a supply of electricity is to be provided to gas-lighted Council dwellings where the tenant desires it and is prepared to pay an appropriately increased rent. The estimated cost is £7,754.

Marshland Rural District Council is to have electricity services installed in twenty-two houses in Smeeth Road, Marshland St. James; Benn's Lane, Terrington St. Clements; St. John's Road, Tilney St. Lawrence; and Small Lode, Upwell.

Durham City Council has applied for loan sanction for £9,732 for supplying electricity to 336 houses at Sherburn Road and Hatfield View.

Swiss Power Schemes

Work on new power schemes is being speeded up in Switzerland. At the moment sixteen power stations are either under construction or are being rebuilt, according to a report submitted to the Swiss Electricity Users' Association. By 1956 they will provide an additional 2,000 million kWh a year. These are in addition to the four large power stations and a number of smaller units put into operation last year.

Water Power in Angola

A hydro-electric development project in Angola—the Biopio Dam—is estimated to cost in the region of 100 million angolares (about £1,250,000). The first stage, to be completed in four years, will supply 35 million kWh per annum to the towns of Benguela, Lobita and Catumbela.

Increased Costs in Ulster

Dealing with the 1950 report of the Electricity Board for Northern Ireland at a recent Press conference in Belfast, Sir William Robinson, chairman, said that a demand had just been received for a 10 per cent increase for all manual workers. This would cost the Board £55,000 a year and would necessitate increased charges. The high cost of materials and the seemingly unlimited demands for increases of wages and salaries were bringing nearer the day when the burden of tariffs would result in reduced consumption, since neither industry, nor the individual consumer, would be in a position to meet the charges. The Board was losing heavily in rural electrification.

Mr. A. W. Ferguson, chief administrative officer, said that to meet the cost the present rural electrification programme required a return of 21 per cent, whereas it was actually 6½ per cent. The Government of Eire allowed a 50 per cent grant against capital charges, but the Northern Ireland Government contributed nothing.

Indian Mill Restriction

To reduce demand on the electricity supply system during peak hours the Government of Bombay has prohibited, for the period from 1st June to 31st January, the working of flour mills, "masala" mills and rice mills from 6 to 10.30 p.m. in an area served by six specified undertakings. The prohibition does not apply on Sundays. The supply companies have been authorized to discontinue the supply to mills found using power during the prohibited period.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Electric Construction Co., Ltd.—In a circulated report to be presented at the annual general meeting on 27th July, Mr. W. M. Furniss, chairman and managing director, comments on the way in which employees have responded to the profit sharing scheme and says that it is partly due to their increased efforts that production has reached its present volume. The volume of orders on hand is materially greater than for the same period of last year, but raw materials are scarcer. Because of the unsatisfactory state of the small motor market, the lease of the factory purchased at Feltham two years ago has been disposed of and the plant has been transferred to Wolverhampton.

Brazilian Traction, Light & Power Co., Ltd.—At the annual general meeting held on 26th June in Toronto, Mr. H. Borden, the president, said that telephone subscribers had increased by about 30,000 in 1950, making about 440,000 in service. The telephone service was, however, falling far short of the unexpected rapidity of demand. During 1950 the electric power capacity was increased by 91,000 kW, represented by the floating steam plant put into operation in Rio and the bringing into operation of unit No. 8 at the Serra Cubatao plant. To meet increasing demands the construction of the new Forcacava No. 1 station near the existing Lages plant had been commenced, of six units totalling 330,000 kW, and it was hoped to have the first two, with a total of 70,000 kW, in operation about the middle of 1952. This would be the first underground plant in Brazil and by far the largest of this type in the western hemisphere. Plans for the construction of the 160,000 kW steam plant in Sao Paulo were well advanced and it was hoped that this plant would be brought into operation in 1954. The equipment had been ordered for the next hydro-electric project to be located underground near the existing Cubatao plant and to consist of at least four and probably ultimately six units of 65,000 kW each.

Associated Electrical Industries, Ltd., is to hold meetings on 27th July to consider proposals for the conversion of the 8 per cent preference stock into 4½ per cent preference stock and for the issue of further ordinary and 4½ per cent preference shares. Under the proposed scheme any holder of 8 per cent cumulative preference stock who converts his holding will have the right to subscribe in cash at par for three new £1 ordinary shares in respect of every £10 nominal of 8 per cent stock converted. It is also proposed to offer a further 330,760 4½ per cent £1 preference shares for subscription in cash at par to holders of preference stock whether converted or not. To carry these proposals into effect the capital is to be increased from £8,696,050 to £10,000,000, making the authorized capital £3,000,000 in preference and £7,000,000 in ordinary stock. The new ordinary shares will not rank for interim dividend but will receive the final ordinary dividend for 1951.

Atlas Electric & General Trust, Ltd.—Mr. D. M. Touche, the chairman, stated at the annual general meeting held on 21st June that the gross investment income received, at £547,281, had exceeded the half-million mark for the first time in the history of the company. It showed an increase of £81,743 or 17.56 per cent upon the collection for the previous year.

Marryat & Scott Holdings, Ltd., announce that, before taxation amounting to £49,622, the net profit for the period 12th October to 31st March was £88,635. Before acquisition the profit of subsidiaries was £126,469. After transferring £1,750 to capital redemption reserve fund, a dividend at the rate of 22½ per cent is to be paid and £14,708 is carried forward.

British Electric Traction Co., Ltd.—The aggregate net profit of the group, after providing £850.804 (£921,340) for taxation, is £1,211,426 (£1,350,266). Allowing for minority interests in subsidiaries, the proportion attributable to the parent company is £1.085,748 (£1,172,628). Deducting the balance of profits retained by subsidiaries, £446,501 (£534,597), the net profit of the parent company is £639,247 (£638,031).

A. C. Cossor, Ltd.—The group trading profits were almost doubled in the year ended 31st March, rising from £240,553 to £473,549. After providing for all charges, including taxation, and the preference dividend, a surplus of £48,348 is carried forward compared with a deficit of £96,526 in the previous year and £195,896 in 1948-49. Lord Burghley, the chairman, says that no payment on account of preference arrears would have been made unless the directors had felt that there was

a reasonable prospect of being able to clear off the two years' arrears in due course.

E. K. Cole, Ltd.—After providing £270,002 (£133,005) for tax, the group net profit for the year ended 31st March was £155,050 (£100,681). A final dividend of 15 per cent (against 12 per cent) is to be paid, making 25 per cent (20 per cent) for the year.

Drake & Gorham, Ltd., report a group net loss for the period 1st July, 1950, to 3rd April, 1951, amounting to £5,857, compared with a profit of £14,158 for the previous year. The ordinary dividend is maintained at 5 per cent and £29,587 (£41,413) is carried forward.

Broadcast Relay Service, Ltd., shows a consolidated net profit of £528,903 (£460,640) for the year ended 31st March after providing for tax, etc. Of this sum £347,509 (£327,588) represents the parent company's share. The board states that the rapid development of overseas business has exceeded expectations.

The Renold & Coventry Chain Co., Ltd., reports a group net profit attributable to the holding company of £350,066 for the year ended 1st April, compared with £318,940 in the previous year. Of this £58,000 (£47,000) has been reserved for re-equipment and £69,710 (nil) for tax equalization, leaving £222,356 (£271,940) to which is added £14,046 (£19,877) tax adjustments. General reserves receive £90,000 (£140,000) and the final dividend is raised from 12 to 14½ per cent, making 17½ per cent (12 per cent) for the year. The carry-forward is increased from £154,757 to £187,249.

Waite & Son, Ltd., show a profit for the year ended 31st March amounting to £51,603 (£33,138). The dividend is maintained at 10 per cent, plus a bonus of 5 per cent (nil) and £5,474 (£3,628) is carried forward.

Electric & General Investment Co., Ltd., is to pay a dividend of 15 per cent on increased capital. The net profit to 31st May is £8,652 (£6,631) and the carry-forward £24,825 (£22,079).

Ericsson Telephones, Ltd.—Helbert, Wagg & Co., Ltd., have purchased 174,015 ordinary stock units of 5s each, representing the balance of the holding of the Telefonaktiebolaget L. M. Ericsson, Stockholm. These stock units have been placed privately and a proportion will be available in the market.

Hick, Hargreaves & Co., Ltd., are paying a final dividend of 13 per cent on increased capital, making 15 per cent (10 per cent) for the year.

Hackbridge Cable Holdings, Ltd.—The company, referring to a note on page 1331 of our 22nd June issue, points out that its final ordinary dividend for the year ended 31st March, 1950, was 12½ per cent, making 20 per cent for the year.

New Companies

Wall Bros. (Radio-Electric), Ltd.—Registered 22nd May. Capital £2,000. Radio and television engineers, sound, acoustic and electrical engineers, etc. Directors: H. V. Wall and S. F. Wall. Regd. office: 47, High Street, Ramsey, Hunts.

Element Assemblies, Ltd.—Registered 11th April. Capital £100. Manufacturers and factors of and wholesale and retail dealers in electrical fittings and appliances of all kinds, etc. Directors: B. L. Lightfoot, Amelia E. Lightfoot and Eleanor Lightfoot. Regd. office: 202, Green Lanes, Palmer's Green, N.13.

Telesound Services, Ltd.—Registered 31st May. Capital £100. Radio and television engineers, etc. Directors: D. Cross, R. R. Ramsay, A. G. E. Mousley and D. J. Comber. Regd. office: 38, Court Parade, North Wembley, Mdx.

Quality Contractors (Ludlow), Ltd.—Registered 7th June. Capital £200. To acquire the business of electrical engineers carried on by H. J. Edwards, J. C. Godber, C. E. Meredith and J. W. Price at Mill Street, Ludlow, as Quality Contractors; and to carry on the business of electricians, electrical, radio, television, refrigeration and mechanical engineers, etc. Directors: H. J. Edwards, J. C. Godber, C. E. Meredith and J. W. Price. Regd. office: Mill Street, Ludlow, Shropshire.

Init Products, Ltd.—Registered 7th June. Capital £100. To acquire and develop inventions, formulæ and processes relating to the incorporation of wires, circuits, connectors, components and devices for electric conduction into goods made wholly or partly of porcelain and ceramics, etc. M. D. S. Becher signs as director. Regd. office: 17, Curzon Street, W.1.

Alkasol, Ltd.—Registered 14th June. Capital £100. Manufacturers and dealers in electrolyte of all kinds, batteries, accumulators, generators and electrical, radio and television apparatus, etc. Directors: A. Elliott and A. H. Travis. Secretary: A. H. Travis. Regd. office: Old Bank Buildings, High Street, Rotherham.

Talbot Electric Supplies & Engineering Co., Ltd.—Registered 16th June. Capital £100. Subscribers: A. J. Gear and Freda S. Thom. Solicitors: Stanley Jarrett & Co., 17, Shaftesbury Avenue, W.1.

Morley's Electrical Services (Holloway), Ltd.—Registered 21st June. Capital £100. Electricians, radio and television

engineers, etc. Directors: Patricia Morley, D. E. Cowling (director of Cowling & Holdsworth, Ltd.), A. V. Holdsworth (director of Cowling & Holdsworth, Ltd.), and Irene M. Heller. Secretary: D. E. Cowling. Regd. office: 117, Hornsey Road, N.7.

Vicom & Co., Ltd.—Registered 29th June. Capital £3,000. Manufacturers, fitters and sellers of and dealers in electrical, electronic and telephonic equipment; precision, mechanical and electrical engineers, etc. Directors: E. C. Woodall, J. D. Christopher and J. F. Colliver. Secretary: A. G. Howard. Regd. office: 7, Cork Street, W.1.

V. L. Dewitt, Ltd.—Registered 30th June. Capital £1,000. Manufacturers of and dealers in electrical, radio and television apparatus, etc. Directors: V. L. Dewitt and Mrs. Marian Dewitt (secretary). Regd. office: 3, Oxford Street, W.1.

Electrical Wholesalers (Shropshire), Ltd.—Registered 30th June. Capital £10,000. Directors: W. A. Balderstone (secretary) and E. W. Jones, jnr. Regd. office: Bridge Road, Wellington, Salop.

Increase of Capital

Nash - Kelvinator, Ltd. (formerly Kelvinator, Ltd.).—Increased by £500,000, in £1 ordinary shares, beyond the registered capital of £500,000. At 24th May, the Nash-Kelvinator Corpn., Michigan, U.S.A., held practically all the issued shares.

Liquidations

British Electric Co. (Beco), Ltd., electrical engineers, 25, Lower Road, London, S.E.16.—The statutory meeting of creditors was held recently when an approximate statement of affairs was submitted showing liabilities amounting to £24,928. The assets were estimated to produce £10,488 and after allowing £1,007 for preferential and secured claims, there was a deficiency as regarded creditors of £15,447. A resolution was passed confirming the voluntary liquidation of the company with Mr. A. W. Hunter, of Latham & Co., 185/188, High Holborn, London, W.C.1, as liquidator, with a committee of inspection.

Ideal Electrical & General Engineering Co., Ltd.—Meeting 21st August at 49 & 50, Bradford Street, Walsall, to receive an account of the winding-up by the liquidator, Mr. R. Beevers.

Ranelagh Radio & Electrical Co., Ltd., electrical contractors, 55, Westbourne Grove, London, W.2.—Winding up voluntarily. Liquidator, Mr. A. E. Attwood, 20-21, Lawrence Lane, Cheapside, London, E.C.2.

Bankruptcies

F. Clarkson, electrician and ironmonger, residing and carrying on business at 78, Pall Mall, Chorley, Lancs.—Trustee, Mr. L. H. B. Worsley, 14, Acresfield, Bolton, released 14th June, 1951.

B. F. Robbings (trading as Electric House), 1388, Greenford Road, Greenford Green, Middlesex, electrical engineer and contractor. —Receiving order made 29th June on a creditor's petition.

L. R. Maisey, electrical contractor, carrying on business as R. Maisey at 50, High Street, Alfreton, Derbyshire, and at 3, Main Road, Jacksdale, Notts.—Receiving order made 29th June on debtor's own petition.

W. T. Spencer, electrician, 376, Oldham Road, Newton Heath, Manchester.—Trustee, Mr. F. C. Ormrod, 20, Byrom Street, Manchester, released 28th June, 1951.

D. Cromwell and **V. I. Cromwell,** trading as Cromwell & Co., Hindsley Works, Hindsley Place, Forest Hill, London, S.E.23, electrical fittings and lampshade manufacturers.—First meeting 16th July at 3, Central Buildings, Matthew Parker Street, Westminster, S.W.1. Public examination 20th September at the County Court, Scarbrook Road, Croydon.

P. W. Howard, carrying on business as Buckingham & Howard at 29, St. Peter's Street, Ipswich, radio and television engineer.—First meeting 13th July at 13a, Great Colman Street, Ipswich. Public examination 13th September at the Shire Hall, St. Helens, Ipswich.

G. C. Higgins, 8, Carlton Road, Whalley Range, Manchester, electrical engineer.—First meeting 17th July at the Official Receiver's office, 20, Byrom Street, Manchester. Public examination 20th July at the Court House, Quay Street, Manchester.

L. C. Overton, King Street, Bakewell, Derbyshire, electrician.—Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham, Official Receiver, released 4th July, 1951.

H. R. Aarons, 35, Tallack Road, Leyton, London, E.10, lately carrying on business as Radco Co. (Wholesalers) Leyton, at 764, Lea Bridge Road, E.17, and 35, Tallack Road, E.10, electrical wholesaler.—Last day for receiving proofs for dividend, 20th July. Trustee, Mr. B. Phillips, 76, New Cavendish Street, London, W.1.

A. W. Harber, carrying on business at 1, Kathleen Place, Redditch, electrician.—Supplemental dividend of 19s 5d (making 20s) in the £, payable 8th August at the Official Receiver's office, Somerset House, 37, Temple Street, Birmingham, 2.

STOCKS and SHARES

THE approach towards peace in Korea has had little—perhaps surprisingly little—effect upon Stock Exchange markets. If anything, it tended to reduce the volume of general business, while at the same time it served to maintain the mild recovery that had occurred in gilt-edged securities. The British Government stocks in the nationalized sections, transport, electricity and so on, have recovered from the recent lowest, and a certain amount of "institutional" buying has been noted. In the industrial and commercial departments, the disposition has been to wait upon the course of events, following possible conclusion of peace in the Far East. The Persian position overhangs Stock Exchange markets.

A.E.I. Preference

Holders of Associated Electrical Industries 8 per cent preference stock have details now of the conversion and "rights" proposals. These are all that remain of the company's original capital intentions, which included the issue of a million ordinary shares at 40s to present holders, and of 700,000 shares to employees on the same terms: both issues were frustrated by official rulings. The 8 per cent preference stockholders are invited to convert their holdings into 4½ per cent preference stock, compensation being the right to subscribe in cash for new ordinary shares, at par, in the ratio of three ordinary for every £10 preference stock. Further 4½ per cent preference are to be offered at par to all holders of the 8 per cents, whether converted or not. Those who convert will be able to sell the rights if they do not wish to take their entitlement of ordinary shares. With the existing ordinary quoted at 93s 9d these rights would be worth something over 22s per preference share now held. Assuming a market price of par for the new 4½ per cent issue, the all-in value of the 8 per cents may be calculated as being about 2s above their present market quotation of 40s. Meetings are being held on the 27th of this month.

Cable & Wireless

It was a little over a year ago that dealings began in the new Cable & Wireless (Holding) Company's stocks which emerged from the reorganization of the concern into an investment trust. Former holders who decided, from the various options open to them, in favour of the new ordinary stock, have reason now to congratulate themselves in seeing the latter through an inauspicious beginning, in the course of which the price fell to 90. It is now at 124½, after stock had changed hands above 130, main credit for the rise in price being due to the declaration early this year of a 6 per cent dividend, which was higher than the market had been led to expect by previous calculations. It gives a 4¾ per cent return on the money at the present price of the ordinary stock.

Easier Prices

The general disposition of prices in the industrial market during the past week showed a dullish tendency. Amongst rises that occurred, British Vacuum stand out at 17s, with a gain of 2s 3d. Rises of 1s 3d occurred in Telegraph Condenser, 38s 9d, E. K. Cole 23s, and Cawnpore Electric, 33s 9d. Baldwins were a little better at 6s, Globe ordinary at 25s 6d. On the other side of the sheet, falls included Lancashire Dynamo 5⅜, De La Rue 35s, Associated Electrical 93s 9d, English Electric 68s 9d, General Electric 93s 6d, Chloride 72s 6d, Reyrolle 90s, and Lucas 42s 6d. C. A. Parsons at 5·3/16 lost a little of their recent rise, and Telephone Manufacturing at 10s 9d are a few pence lower.

Radio Results

Better profits reported on the same day of last week by both A. C. Cossor and E. K. Cole caused a hardening of already firm conditions in the market for radio and allied shares. Cossor shares gained a few pence at 14s 6d, on confirmation of the company's earlier forecast that profits for 1950–51 would eliminate the debit outstanding from previous years, and provide for a year's payment on account of preference dividend arrears. In the event, group trading profits before tax were nearly doubled at a figure which has been exceeded only once in the company's experience. Since 1949, a deficiency of £196,000 in profit and loss account has been converted into a small credit, while the overdraft has been reduced from £781,000 to £260,000. Looking forward, Lord Burghley says in the report that the preference payment would not have been made without the reasonable prospect of regular dividends being resumed, and of arrears being cleared.

Ekco Dividend

Dividends and preliminary figures announced by E. K. Cole were much in line with the good results which the market had been anticipating on the strength of the previous increase in the interim dividend. After strengthening to 23s in advance of the news, the 5s ordinary shares showed no subsequent change. With the final dividend raised by 3 per cent, the total of 25 per cent compares with last year's 20 per cent. The 50 per cent rise in taxed group profits provides amply for the larger payment, on which the shares now show a return of 5¼ per cent.

Engineering in Europe

Survey of Current Literature

THIS article is in the main based on a comparison of Belgian, British and German practice under the main headings of cables for fixed installations and for mobile equipment. The first of these groups is sub-divided into the two sub-groups of cables for transmission lines, feeders and distribution systems on the various levels (generally with paper insulation), and wiring material for low-power equipment and installations, mainly lighting systems, which is normally rubber-insulated. Foremost considerations are obviously the protection of the cables against mechanical damage and fire dangers. It is surprising that, apart from Great Britain, few countries have issued special regulations for this important kind of electrical material and even Germany has only general guiding rules for the erection and operation of electrical plant in mines.

The principles of erection of cables in mines are outlined and the mechanical stresses on bending, traction and torsion of stranded conductors sketched, because they lead to essential rules about the number of strands in the different layers of such cables which have to be observed for avoiding deformations of the strands. Cables with main and auxiliary conductors are then considered and their different arrangements shown in comparative tables (this refers to flexible cables). The sections dealing with protection and armouring also consider American practice. In the section on the sheathing of flexible cables, experience gained with synthetic rubber and plastics as sheet materials is reported rather too briefly. —" Present State and Trends in the Production of Mining Cables," J. A. Giaro, *Bulletin Sci. Ass. Ing. Elect. Montefiore*, No. 3, pp. 132–153, March, 1951, in French.

Transformer Forces

Since modern transformer construction generally uses cylindrical coils, axial current forces can only be due to non-uniformities of the AT/length ratio. These may either be unavoidable, say, due to the presence of tappings or to more strongly insulated front or end turns; to unequal yoke spacings, which are all regular features of modern transformers; or to errors in production and assembling. It is clear that those of the first kind may be calculated, the second only estimated. A simple means of assessing the axial forces actually produced in a finished transformer and of estimating the inaccuracies of assembly and machining will certainly be welcome and the more so when it is realized that the axial forces on short-circuit in large transformers may reach the order of several hundred tons.

The method presented enables the axial and radial forces to be calculated on the simple formula of the mechanical force between infinitely thin conductors, which are then corrected for, or converted to, the case of transformers with cylindrical coils by correction curves. Short-circuit tests for different positions of the tap-changing switch, or short-circuiting of individual coils, provide a simple check on the calculated values of the axial forces and give valuable hints as to faults or inaccuracies of assembly and production.—" Calculation of the Current Forces in Transformers and their Experimental Verification on the Test Bench," E. Festl, *E.T.Z.*, Vol. 72, No. 6, pp. 173–176, March 15th, 1951, in German.

Insulation Tracking

Creeping or surface leakage current has been defined as a current on the surface, or in the surface layers, of what in a dry and clean condition is a good insulating material between parts at different potentials when the surface of the insulant is exposed to external deposition of foreign matter, moisture, etc. (V.D.E. Regulations). Tracking is the formation of conducting paths on the surface of an insulant and the resistance against it contributes to the dielectric properties of an insulator and may be increased by an appropriate design of the insulator. It is thus necessary to distinguish between the " tracking resistance " of the *material* and the " tracking safety " of the finished insulator.

This article discusses fundamental research

into the causes and character of the creeping currents, which revealed the electrolytic processes in the moisture film adsorbed on the insulator surface as being partly responsible for track formation and then gives a more detailed account of various testing methods for resistance to tracking, such as the drop method, the immersion method and the micafil vapour test. Finally it considers the role of arcing processes on the insulator surface in track formation. The arc-over resistance of insulants and the methods of testing it (mainly developed in the U.S.A.) are considered. Distinctions must be made between arcing resistance at l.v. and at h.v. and, correspondingly, between resistance to tracking at l.v. and h.v. which are tested by different methods. —" The Resistance to Tracking of Insulating Materials," W. Knappe, *E.T.Z.*, Vol. 72, No. 8, pp. 224–228, 15th April, 1951, in German.

Readers may arrange, by request, to obtain full translations of any of the articles abstracted in this section.—*Eds., Electrical Review.*

WEST GERMANY'S ELECTRICAL TRADE

EXPORTS of electrical goods from the German Federal Republic last year were Dm308,114,000 in value, more than three times as much as in 1949. (In 1949 up to September the Deutsche mark stood at 13·43 to the £; since then at 11·76.) The accompanying table shows some of the leading customer countries; besides these Germany has made a restart—though here and there in a small way only—in most of her former markets.

Electrical imports last year totalled Dm53,418,000 against Dm28,732,000 in 1949.

Class of Equipment	1950 Dm (000)	Inc. or dec. on 1949 Dm (000)
Dynamos, motors, convertors and transformers up to 10 kg.	3,094	+ 2,556
To Belgium	391	+ 324
„ *Holland*	430	+ 354
„ *Italy*	423	+ 422
„ *Norway*	63	+ 51
„ *Switzerland*	506	+ 466
„ *Sweden*	243	+ 131
Ditto, 10 to 25 kg.	1,499	+ 979
To Holland	510	+ 318
„ *Sweden*	175	− 1
„ *Belgium*	206	+ 160
Ditto, over 25 kg.	36,123	+ 27,467
To Belgium	981	− 674
„ *Holland*	3,677	+ 2,497
„ *Sweden*	3,844	+ 2,604
„ *Turkey*	2,008	+ 1,844
„ *Austria*	6,864	+ 5,489
„ *India*	923	+ 405
Complete armatures and commutators	4,701	+ 1,384
To France	1,407	+ 1,407
„ *Austria*	555	− 1,113
„ *Holland*	697	+ 479
„ *Saar*	364	− 515
Cable, underground or submarine	28,823	+ 20,359
To Holland	5,178	+ 3,406
„ *Denmark*	4,791	+ 4,722
„ *Turkey*	1,960	+ 1,751
„ *Indonesia*	1,099	+ 665
„ *Sweden*	1,342	+ 489
Telegraph material	4,965	+ 4,186
To Belgium	412	+ 289
„ *Holland*	631	+ 447
„ *Austria*	307	+ 222
„ *Sweden*	436	+ 386
„ *Norway*	140	+ 80
Telephone material	11,530	+ 8,187
To Colombia	594	+ 594
„ *Belgium*	555	+ 305
„ *Turkey*	698	+ 621
„ *Holland*	1,646	+ 835
„ *Saar*	1,790	+ 1,025
Radio apparatus	20,316	+ 16,738
To Belgium	1,174	+ 852
„ *Holland*	2,860	+ 2,625
„ *Turkey*	3,182	+ 3,008
„ *Switzerland*	2,713	+ 1,777
Measuring, etc., instruments	21,861	+ 14,517
To Belgium	794	+ 343
„ *Denmark*	1,241	+ 1,178
„ *Finland*	1,468	+ 1,454
„ *Holland*	2,454	+ 1,661
„ *Sweden*	4,445	+ 2,662
Heating, cooking, etc., apparatus	6,240	+ 4,680
To Belgium	815	+ 605
„ *Holland*	1,293	+ 1,122
„ *Italy*	497	+ 423
„ *Greece*	243	+ 128
„ *Switzerland*	499	+ 248
Lighting, power transmission, switch, etc., equipment	75,527	+ 52,027
To Belgium	5,170	+ 3,296
„ *Saar*	3,510	+ 740
„ *Finland*	1,687	+ 42
„ *Austria*	3,884	+ 2,470
„ *Holland*	17,034	+ 11,501
„ *Switzerland*	2,220	+ 1,191
Lighting and starting equipment for i.c. engines	3,362	+ 242
To Switzerland	82	+ 29
„ *Holland*	229	+ 198
„ *Sweden*	1,507	+ 882
Ignition, etc., equipment for heavy vehicles	17,389	+ 10,086
To Belgium	1,144	+ 744
„ *Denmark*	1,769	+ 1,373
„ *Holland*	2,329	+ 1,767
„ *Sweden*	3,601	+ 2,292
„ *Switzerland*	1,093	+ 138
Electro-medical apparatus	21,490	+ 14,855
To Holland	1,183	+ 512
„ *Sweden*	1,359	+ 143
„ *Switzerland*	1,210	+ 497
„ *Argentina*	2,708	+ 2,646
„ *Brazil*	2,436	+ 1,854

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Ironclad Switches

A DEPARTURE from conventional design has been adopted in a range of ironclad switches made by WILLIAM MCGEOCH & CO., LTD., 46, Coventry Road, Birmingham, 10. Types are available for both 5 A and 15 A in up to four ways. Internal spout entries are provided in the one-, two- and three-gang boxes, taper threading preventing the conduit from entering the box. The four-gang boxes have undrilled end pads at both ends. There is ample room for wiring. Prices range from 6s each for the 5 A single-pole type to 64s for the 15 A double-pole unit.

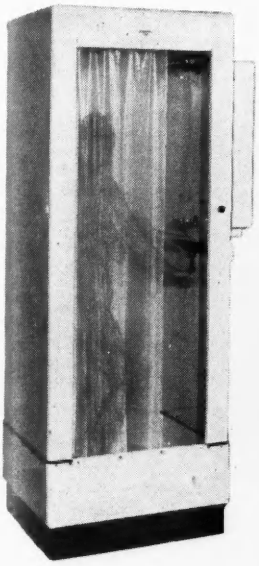
Electrically Heated Shower Bath

The "Hotsprings" electric shower cabinet introduced by SANTON, LTD., Newport, Mon, is suitable for hotels, ships, sports clubs, factories, hospitals and domestic use. It is very useful where space for bathroom facilities is limited.

The thermal storage heater embodied in the unit has a capacity of 3 gall and this together with the necessary cold water is ample for two or three successive shower baths. An average shower of five minutes' duration uses only 2½ gall of mixed hot and cold water and the electricity required to heat this is less than ¼ kWh.

A water mixing valve combined with special arrangement of the storage heater ensures even control of water temperature and a special spray nozzle permits the use of only ¼ gall of water per minute in the form of a fine penetrating spray. The base of the unit has a stand-off waste pipe enabling it to be used as a foot bath if desired.

The heater has a standard 1 kW loading and the recuperative time from cold to 150 deg F is 40 min. Higher loadings can be incorporated.

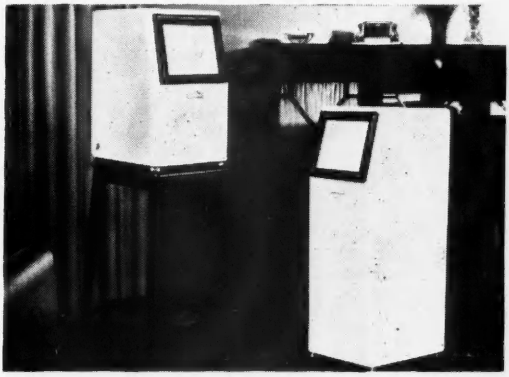


Left: **Santon "Hotsprings" shower bath.**

Below: **Newton daylight "Rotavisor" projector diascopes**

The "Rotavisor"

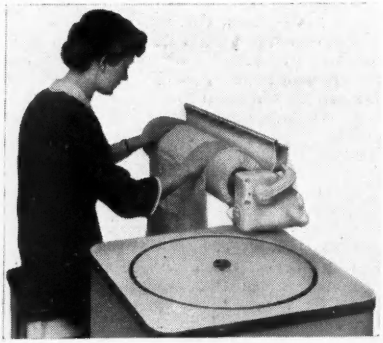
To the range of optical devices, or visual aids, made by NEWTON & CO., LTD. (associated with the Metropolitan-Vickers Electrical Co., Ltd.) there has been added a self-contained film-loop diascope named the "Rotavisor" for unattended demonstration at exhibitions, in showrooms and shop windows, or illustrating educational lectures. The projector is the company's standard "Lightmaster," driven by an a.c. motor off 200–250 V mains; the newness is in its suitability for use in normal daylight without any external screen shading. Sufficiently intense illumination for this purpose is furnished by a B.T.H. high pressure 250 W mercury vapour lamp in a normal cap holder. The loop motion is usually so set that each picture frame is visible for 12 secs before the succeeding one is automatically moved up on to the 10 by 8in



viewing screen. The table model has a push-button for halting the mechanism to permit longer examination of any individual picture or diagram. The console model can be provided with a filament lamp for projection in colours. Standard 35 mm film strip made into loops of up to 80 frames can be accommodated, but there is room for a loop absorber to be fitted. The making of film strip from customers' own illustrations is part of the Newton service. The cabinets are finished in cream cellulose, being 14in wide and 17in deep; the table model is 23in high and weighs 56 lb while the console is 38in high and weighs 85 lb.

Rotary Ironer

A rotary ironer made by the AJAX DOMESTIC APPLIANCE CO., LTD., Johnson Street, Halifax, is interchangeable with the power driven wringer on all "Ada" washing machines. A heat control switch gives six different temperatures each thermostatically controlled to eliminate risk of scorching. The maximum load is 1,250 W.



"Ada" rotary ironer

The heated shoe has a surface equivalent to that of ten ordinary electric irons. Pressure is applied by a simple control handle. The 26in roller has a blanket of padding and canvas with an outside cover of cambric fitted with tapes for easy removal for washing purposes. To avoid stains all the metalwork is of aluminium. The retail price is £19 14s 9d (plus £10 5s 3d P.T. in this country).

Tea Cosy

For keeping tea, coffee, baby foods, etc., warm OLIVER BATTENBERG & Co., 6, Great Winchester Street, London, E.C.2, have brought out the "Thermakozy," an attractively embroidered cosy incorporating an electric heating element. The loading is only about 30 W.

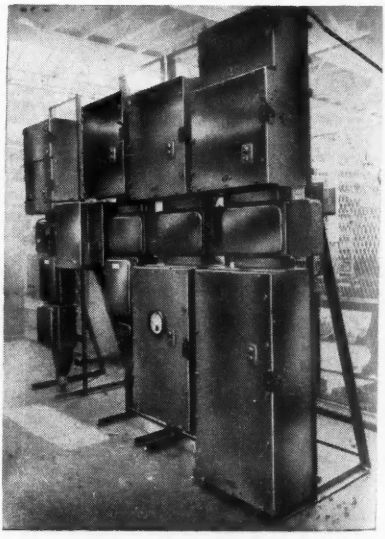
If it is intended to make and keep tea hot for a long period, overnight for instance, it is recommended that the tea leaves be removed by straining or by the use of an infuser. Alternatively, by using only one level teaspoonful or less to a 2 pint pot the leaves can be left in without harm. The price is 41s (plus 17s 6d P.T. in the United Kingdom).

The "Thermakozy"

Motor Control Equipment

A new multi-motor control board for heavy industrial use, known as the Type 948 "Unibord," has been introduced by BROOKHIRST SWITCHGEAR, LTD., Chester. It is of unit construction built from standard assemblies all of which are of the same width and interchangeable. Basically it comprises self-contained, self-supporting frameworks of bolted angle-iron construction which accommodate cast-iron unit busbar chambers and unit contactor-type starting equipments. The latter can be mounted one above the other on the framework supports. Up to six of the smallest size starter cases can be coupled to a single centrally-disposed busbar chamber unit (three above and three below) all on one framework. The starters are standard Type SC straight-on units for up to 200 h.p. 4,000/440 V.

Brookhirst "Unibord" motor control equipment



NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

17181. O'Dell, A. E. (F. Sauter Akt.-Ges. Fabrik Elektr. Apparate).—Manually-operated switches. 5th July, 1945. (656391.)

1946

11003. Philips Lamps, Ltd.—High-frequency pulse-modulation systems. 10th April, 1946. (656451.)

15014. Standard Telephones & Cables, Ltd.—Oscillator construction. 17th May, 1946. (656389.)

1947

5169. Philips Lamps, Ltd.—Electric resistances. 21st February, 1947. (656512.)

7154. Western Electric Co., Inc.—Light-sensitive electrical devices and thermistors. 14th March, 1947. (656454.)

11092. Pye, Ltd., Edwards, B. J., and Johnstone, D. M.—Colour television systems and apparatus therefor. 12th August, 1949. (656516.)

14338. Daphne Investment Trust.—Telephonograph. 29th May, 1947. (656393.)

15527. Eastern Industries, Inc.—Radio-echo apparatus for detecting and/or measuring the speed of moving objects. 12th June, 1947. (656394.)

23554. Standard Telephones & Cables, Ltd.—Electron-velocity modulation devices. 26th August, 1947. (656521.)

23642. Lucas, S. H.—Methods and apparatus for increasing transmutation efficiency of nuclear reactions and converting nuclear energy into power. 14th June, 1948. (656398.)

23671. Philips Electrical, Ltd.—Manufacture of electric discharge tubes. 27th August, 1947. (656522.)

24810. Condliffe, G. E., Harker, M. G., and Lucas, W. P.—Apparatus for generating television signals or recording television pictures, by scanning kinematograph films. 14th August, 1948. (656292.)

24989. Charlin, A. M. B.—Detection of movements by means of a system of stationary acoustic waves. 11th September, 1947. (656299.)

25951. British Thomson-Houston Co., Ltd.—High-frequency convertors. 24th September, 1947. (656524.)

27114. Etablissements Merlin & Gerin.—Cooling arrangements for electrical transformers. 9th October, 1947. (Addition to 648697.) (656458.)

28810. Stevenson, J. B., and Fulcher, T. H.—Electrode assemblies for electron-discharge devices. 12th October, 1948. (656459.)

31557. British Thomson-Houston Co., Ltd.—Electrical bushings. 28th November, 1947. (656404.)

33998. Soc. Nationale d'Etude et de Construction de Moteurs d'Aviation.—Cathode-ray tube trace recording apparatus. 23rd December, 1947. (Cognate application 33999, 19th May, 1947.) (656464.)

35288. Guanella, G.—Direction finding indicating, control and like systems employing radiant wave energy. 31st December, 1947. (656294.)

1948

8775. Van Der Heem, N. V.—Electric floor polishers. 25th March, 1948. (656479.)

11850. Szarvas, F.—Electric cigarette lighters. 30th April, 1948. (656481.)

12259. Autophon Akt.-Ges.—Installation for calling in wireless communication transmitting and receiving stations. 4th May, 1948. (656482.)

14231. Radio Corporation of America.—Colour television system. 26th May, 1948. (656484.)

18159. Autophon Akt.-Ges.—Installation for wireless calling in circuits comprising combined transmitting and receiving stations. 6th July, 1948. (656486.)

19778. Radio Corporation of America.—Receiver for selective reception. 23rd July, 1948. (656295.)

20156. E.S.A. (Yewtree), Ltd., and Plester, H. H.—Thermostatically controlled switch for electrically heated apparatus. 26th August, 1949. (656489.)

23174. Pestarini, G. M.—Constant current electrical installations. 2nd September, 1948. (656490.)

23729. Metropolitan-Vickers Electrical Co., Ltd., and Thorneley, N.—Railway vehicles. 1st September, 1949. (Cognate application 8925, 1st April, 1949.) (656298.)

25684. British Mechanical Productions, Ltd., and Deakin, S. T.—Production of rods, tubes, and the like from polytetrafluorethylene. 29th September, 1949. (656300.)

25970. British Thomson-Houston Co., Ltd.—Electric frequency transformation systems. 5th October, 1948. (656499.)

27265. Philips Electrical, Ltd.—Arrangements for receiving signals transmitted by means of pulses of constant amplitude. 10th April, 1946. (Divided out of 656451.) (656502.)

28821. Standard Telephones & Cables, Ltd.—Systems for secrecy in electrical pulse communication. 5th November, 1948. (656505.)

30547. Metropolitan-Vickers Electrical Co., Ltd., Evans, O. T., and Ghalib, S. A.—Electrical control systems for winding and like motors. 21st November, 1949. (656304.)

32181. Electro-Mécanique de l'Aveyron.—Electric brakes, especially for automobile vehicles. 15th December, 1948. (656308.)

33454. Radio Corporation of America.—Regulated voltage supply. 29th December, 1948. (656536.)

33692. Radio Corporation of America.—Method of preparing magnetic materials and product thereof. 31st December, 1948. (656537.)

1949

55. Pirelli-General Cable Works, Ltd., and Arman, A. N.—Oil- or gas-filled electric cables. 13th December, 1949. (656320.)

290. Igranic Electric Co., Ltd.—Electric heaters. 5th January, 1949. (656346.)

297. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Variable electrical condensers comprising two interfitting electrodes. 5th January, 1949. (656349.)

307. Telefonaktiebolaget L. M. Ericsson.—Relay chain. 5th January, 1949. (656350.)

323. Bendix Aviation Corporation.—Electrical regulating system for a motor generator. 5th January, 1949. (656416.)

336. Dow Chemical Co.—Rapid-wetting gypsum-base backfill for cathodic protection of metals. 5th January, 1949. (656326.)

337. Dow Chemical Co.—Packaged anodes for cathodic protection. 5th January, 1949. (656418.)

364. Revo Electric Co., Ltd., and Felton, A. E.—Automatic cut-outs for electric kettles and like utensils. 6th January, 1950. (656422.)

370. Quasi-Arc Co., Ltd., Mitchell, E. J. M., and Wilks, P. F.—Arc welding electrodes. 6th January, 1950. (656423.)

375. Cinema-Television, Ltd., and Bartle, O.—Cathode-ray tubes or the like. 6th December, 1949. (656424.)

376. Westinghouse Brake & Signal Co., Ltd., and Peter, L. H.—Illuminated signal devices for railways and the like. 8th December, 1949. (656425.)

399. Allen, E. H.—Aerials. 25th October, 1949. (656426.)

400. Allen, E. H.—Ferrules for mounting cables in terminals. 25th October, 1949. (656427.)

403. British Thomson-Houston Co., Ltd., and Lukes, J. A.—Electric multiple contact breakers. 24th November, 1949. (656351.)

538. Electric Time Rentals, Ltd., and Phillips, W. K. V.—Apparatus responsive to the movement of a body relative to a detecting surface or surfaces. 7th January, 1949. (656366.)

596. J. A. Crabtree & Co., Ltd., Morgan, R. W., and Coleman, E.—Electric lampholders. 29th October, 1949. (656429.)

637. B. F. Goodrich Co.—Electrically heated apparatus for preventing the accumulation of ice. 10th January, 1949. (656373.)

662. Telefonaktiebolaget L. M. Ericsson.—Bearing device for relay armatures and the like. 10th January, 1949. (656539.)

730. Bombonato, G. E.—Electric darning apparatus. 11th January, 1949. (656381.)

744. Plessey Co., Ltd.—Electromagnetic vibratory interrupters. 11th January, 1949. (656384.)

757. British Thomson-Houston Co., Ltd.—Hydrocarbon-substituted silyl methane compounds. 11th January, 1949. (656385.)

783. Metropolitan-Vickers Electrical Co., Ltd.—Electric induction heating apparatus. 11th January, 1949. (656431.)

890. British Thomson-Houston Co., Ltd.—Methods of operating spinner type washing-machines to prevent suds lock. 12th January, 1949. (656439.)

988. British Thomson-Houston Co., Ltd.—Pneumatic vibrating machines employed in fatigue testing materials. 13th January, 1949. (656447.)

995. Magnet Akt.-Ges., and Diener, R.—Electromagnetic device for effecting automatic displacement of the tool from the workpiece during the return stroke of a reciprocating planing or like machine. 13th January, 1949. (656448.)

1950

16196. Jones & Co. (Engineers), Ltd., and Hills, E. G.—Stand-by electrical supply apparatus. 9th August, 1949. (Divided out of 656580.) (656596.)

31325. Mercer, R.—Telephone systems. 13th January, 1949. (Cognate application 31326, 10th August, 1948.) (Divided out of 656559.) (656599.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates mentioned:—

27th July

SILVER DUKE and SILVER KING. Nos. B697,776-7, Class 7. Machines for preparing and dispensing ice cream and refrigerated drinks.—Gardiner & Gulland, Ltd., Garland Works, Hither Green Station, London, S.E.13.

GUARDION. No. B697,570, Class 9. Electrical instruments and apparatus and parts thereof, all included in Class 9.—F. A. Hughes & Co., Ltd., 82, Piccadilly, London, W.1.

AMAL (design). No. 698,155, Class 9. Electrical and scientific measuring and checking (supervision) apparatus and instruments, all included in Class 9.—Amal, Ltd., Holford Works, Perry Barr, Birmingham.

ALABAR. No. 698,024, Class 10. Diffuser shades for fluorescent lighting.—Scemco, Ltd., 6, Soho Street, London, W.1.

4th August

GENYK. No. 696,762, Class 6. Electric conduit tubing; elbows, tees, bends and junction and coupling fittings, all for electric conduit tubing; and clips for securing electric conduits in position; all of common metal. Also No. 696,763, Class 9. Junction boxes, switch boxes (electric) and mountings, being parts of electric switches included in Class 9.—Hygienic Wire Works, Ltd., 79, Miles Road, Mitcham, Surrey.

TUSCAN. No. B682,668, Class 7. Electric motors (other than for land vehicles).—Tuscan Engineering Co., Ltd., North Road, Trading Estate, Bridgend, Glam.

STAR. No. 695,185, Class 8. Safety razors and electric shaving instruments, and parts of electric shaving instruments in Class 8.—Ever-Ready Razor Products, Ltd., Ever-Ready Corner, The Hyde, London, N.W.9.

BEMA. No. 687,299, Class 9. Tester valves for checking the accuracy of pressure gauges on boilers, pressure gauges, apparatus for detecting cracks in steam boilers and for giving warning thereof, and apparatus for giving alarm when water in boilers falls to a low level.—British Engine Boilers & Electrical Insurance Co., Ltd., 24, Fennel Street, Manchester. 4.

SAFT. No. 694,263, and ALCABLOC. No. 694,264, Class 9. Electrical apparatus and instruments included in Class 9.—Société des Accumulateurs Fixes et de Traction, Romainville (Seine), France. Address for service, c/o Mewburn, Ellis & Co., 70/2, Chancery Lane, London, W.C.2.

MEK-ELEK. No. B697,028, Class 9. Electrical apparatus and instruments included in Class 9. Also No. B697,029, Class 11. Electric lighting installations.—Mek-Elek Engineering, Ltd., 17, Western Road, Mitcham, Surrey.

GLOMASTER. No. 698,599, Class 11. Electric torches; lamps for motor vehicles and parts included in Class 11; and vehicle reflectors and anti-dazzle devices for motor vehicle lamps.—Notek Electric Co., Ltd., 23, London Road, Bromley, Kent.

London Tram Conversion

LAST week-end the fourth stage of the conversion of South London's tram routes to oil bus operation was put into effect. This stage, the smallest of the nine, involved the replacement of two tram routes and one bus route by three new bus routes, while two existing bus routes were extended. The tram routes superseded were from Greenwich Church to Waterloo Station and from Greenwich Church to London Bridge Station. Altogether 33 trams were withdrawn from service and 38 buses introduced, making the total number of vehicles affected by the conversion to date 313 trams withdrawn and 384 buses (excluding spares) brought into service.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Australia. — SYDNEY. — 6th September. Sydney County Council. Supply of 11 kV, 250 MVA metalclad switching equipments for Concord and Banksmeadow substations. (C.R.E. (I.B.) 64895/51. Ten/2658.)*

Bath.—18th July. Corporate Property Committee. Electrical installation at the Guildhall. Surveyor of corporate property, Guildhall.

Belgium. — BRUSSELS. — 19th September. Belgian State Railways. Hand operated disconnecting switches. (C.R.E. (I.B.) 64640/51. Ten/2669.)*

Durham.—31st July. County Education Committee. Electrical installation, Hartlepool West View New County School. County architect, Court Lane.

Edinburgh.—North of Scotland Hydro-Electric Board. 11 kV and low-voltage distribution lines in the Aberdeen Area. (See this issue.)

Golborne.—2nd August. U.D.C. Street lighting equipment. (See this issue.)

Goole.—23rd July. Borough Council. Sodium and tungsten lighting in various roads in the borough. (See this issue.)

India.—MADRAS.—19th September. Government Electricity Department. Generating plant and switchgear (Spec. No. E.181) for the Dam and Canal power houses of the Tungabhadra hydro-electric scheme, first stage. (C.R.E. (I.B.) 64768/51. Ten/2656.)*

NEW DELHI.—30th July. Directorate General of Supplies and Disposals. Telephone cable. (C.R.E. (I.B.) 64785/51. Ten/2661.)*

MYSORE.—Government Stores Purchasing Committee. The closing date for the receipt of tenders for outdoor kiosk and 13.2 kV equipment at Bangalore has been postponed until 13th August. (C.R.E. (I.B.) 63372/51. Ten/2588A.)*

Rothwell.—25th July. Urban District Council. Sodium street lighting at the Lawrence Villa estate, Woodlesford, and the Spibey Lane estate, Rothwell. (See this issue.)

South Africa.—CAPE TOWN.—16th August. Electricity Department. 10,000 50 A porcelain weatherproof pole fuse units. (C.R.E. (I.B.) 64500/51. Ten/2640.)*

Southern Rhodesia.—SALISBURY.—27th July. Private automatic telephone exchange equipment. (C.R.E. (I.B.) 65130/51. Ten/2671.)*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

ORDERS PLACED

Manchester.—Corporation Housing Committee. Accepted. Electrical installations in 356 houses on the Wythenshawe estate.—A. E. Sudlow & Co., Ltd., and H. C. Taylor & Co.

South Shields.—Town Council. Accepted. Rewiring Ocean Road County Secondary School (£1,217).—A. J. Wares, Ltd.

Stanley (Co. Durham).—U.D.C. Accepted. Street lighting standards and brackets.—Revo Electric Co., Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnet.—Rebuilding of Clare Hall Hospital, South Mimms, for North West Metropolitan Hospital Board (£200,000); regional architect, Portland Place, London, W.1.

Barrow-in-Furness.—Rebuilding nurses' home and laundry at Risedale Maternity Home (£13,032); John Leck & Son (Barrow), Ltd., Hindpool Road.

Birkenhead.—Ambulance station, Salisbury Street; borough architect.

Birmingham.—New hospital, Winterdyne, for Regional Hospital Board; Martin, Martin and Ward, architects, 106, Colmore Row, Birmingham, 3.

Blackburn.—Crematorium and chapel, Pleasington Cemetery (£31,000); C. S. Robinson, town clerk, Town Hall.

Brighton.—Factory and office premises, Crowhurst Road, Hollingbury; Skelton Sleat & Co., Ltd., engineers.

Darlington.—Factory additions at Aycliffe for Toledo Woodhead Springs, Ltd.; Holland & Hannen and Cubitts, Ltd., builders, Howdon-on-Tyne.

Bus station (£18,000); borough engineer.

Doddington.—Pathological laboratory at County Hospital; Ruddle and Wilkinson, architects, Long Causeway Chambers, Peterborough.

Elstree.—Research laboratories; Lister Institute of Preventive Medicine, Chelsea Bridge Road, S.W.1.

Eston.—Houses (75), Granville Road estate, for the U.D.C.; N. C. Harrison, surveyor.

Gosforth (Northumberland).—Flats in Beaumont Terrace and 38 houses and 11 blocks of flats on Church Avenue estate, for U.D.C.; Liddell & Son, builders, 36, North Road, Newcastle-on-Tyne.

Grimsby.—Houses (256), Nunsthorpe estate; borough surveyor.

Guildford.—Houses (124), Bushy Hill; borough surveyor.

Halifax.—Crematorium, Elland; G. Holden, borough surveyor, Crossley Street.

Harrow.—Houses (99), flats (74), and four shops with maisonnettes over, Northolt Racecourse estate; C. H. James, architect to U.D.C., 5, Bloomsbury Street, London, W.C.1.

Hartlepool.—Houses (51), Annandale Crescent; Hartlepools Master Builders' Association.

Hay (Herefordshire).—Houses (48); surveyor, Rural Council Offices, Hay-on-Wye.

Heywood.—Block of maisonnettes at Waterfold Lane; Wm. Townson & Sons, Ltd., Bolton.

Kidsgrove.—Houses (134), Lower Ash and Hollins Farm estate; U.D.C. surveyor.

King's Lynn.—Administrative offices, report and wireless rooms, living accommodation, etc., for constabulary (£75,000); Kerridge, Ltd., builders, Sturton Street, Cambridge.

Lancashire.—Girls' secondary modern school at Holt Lane, Failsworth, and junior and intermediate school, Kirby South housing estate; G. Noel Hill, county architect, Preston.

Leamington.—College for further education, Warwick New Road, near Milverton Station (£750,000), for Warwick E.C.; county architect, Warwick. (Work to be spread over several years.)

Leigh.—Casualty and consultation department at Infirmary (£57,000); A. E. Prescott, Ltd., Holden Road, Leigh, Lancs.

Leominster.—County primary school, Gateway Lane area (£62,375); W. Bowers & Co., Ltd., builders, Bath Street, Hereford.

Limehurst.—Houses (58) and four shops, Waterloo estate; R.D.C. surveyor.

London.—STEPNEY.—Two-storey factory premises, Hanbury Street and Spelman Street; Charles Owen & Co. (Bow), Ltd., helmet manufacturers

BETHNAL GREEN.—Flats (45), Middleton Street; borough engineer.

EAST FINCHLEY.—Flats (36), High Road; Thomas Sibthorp, architect, 27, Grosvenor Place, S.W.1.

Maidstone.—Factory extensions; Esgate, Chamberlain & Co., Ltd., Sandling Road.

Morpeth.—Houses (56), Spelvit Lane site; borough surveyor.

Newcastle-on-Tyne.—Offices, West Blandford Street, for C.W.S., Ltd.; C.W.S. Architects' Dept., 90, Westmorland Road, Newcastle-on-Tyne.

Northumberland.—Modern school at Seahouses; county architect, County Hall, Newcastle-on-Tyne.

Oxhey.—Development of site, Watford Road and Oxhey Drive, for some 100 houses (£339,115), for L.C.C.; director of housing, County Hall, Westminster Bridge, S.E.1.

Ripon.—Houses (22), North Road; city engineer.

Saddleworth.—Houses (50), Carr Lane, Greenfield; Howard and Benson, architects to U.D.C., 88, Mosley Street, Manchester, 2.

St. Albans.—Office block for City Treasurer's Dept.; city surveyor.

Shipley.—Houses (88), Owlet Hall estate; U.D.C. surveyor.

Shiremoor.—Workshops, offices, etc., at Algernon Colliery; National Coal Board, Ashfield Towers, Newcastle-on-Tyne, 3.

Southampton.—Sulphur factory at Fawley; Esso Petroleum Co., Ltd.

Stalybridge.—Dwellings (40), St. George's Housing site; Howard and Benson, architects, 88, Mosley Street, Manchester.

Stanground (Hunts).—Old people's home, for County Welfare Committee; S. J. Hands, county architect, County Buildings, Huntingdon.

Stockport.—New ward units at Stepping Hill Hospital (£47,350); J. Gerrard & Sons, Ltd., Swinton, Manchester.

Stokesley.—Houses for R.D.C. Builders: J. T. Tarran & Son, Hutton Rudby (26 houses); Duncanson & Sons, Acklam Road, Middlesbrough (12); and Greenwell & Co., Ltd., Albert Road, Middlesbrough (8).

Sunderland.—Health centre, Springwell Road (£55,000); borough architect.

Sutton-in-Ashfield.—Houses (48), Mansfield Road site, for U.D.C.; M. D. Sweeney & Palmer, Ltd., Beechdale Road, Aspley, Nottingham.

Thornaby-on-Tees.—Houses, Humber Road (13) and Clarendon Road (26); T. Rea, builder, Acklam Terrace, Thornaby-on-Tees.

Totnes.—Children's home, Broadsands, Churston Ferrers; county architect, Heavitree Road, Exeter.

Tynemouth.—Mineral water factory, Waterville Road, North Shields, for Calverley and Gee; William Stockdale, architect, Howard Street, North Shields.

Offices and workshops, Algernon Pit, Backworth, for the Northern Coal Board, Akenside House, Newcastle-on-Tyne.

Houses (34), Marden East; W. Leech, Ltd., builders, Clayton Street, Newcastle-on-Tyne.

Warrington.—Two-storey clinic buildings at rear of health department premises (£34,192); borough surveyor.

Houses, Orford estate; W. L. Challinor, Bream Avenue, Warrington (22 houses); W. A. Howard, Ltd., East View, Knutsford Road, Grappenhall (20); D. Cooper, Ltd., Clarence Street, Warrington (18); G. Clough, Grappenhall (8).

Whitley Bay.—Houses (26) on the Foxhunters' site; U.D.C. surveyor.

Reconstruction of Hill Heads depot for the U.D.C. (£12,300); E. Roberts, surveyor.

Wolverhampton.—Extensions to laboratories at Royal Hospital for Birmingham Regional Hospital Board (£35,553); A. F. R. Godfrey & Co., Ltd., 10, Clifton Street, Wolverhampton.

Workington.—Houses (76) and 12 flats, Northside estate; borough surveyor.